California Air Resources Board

PUBLIC MEETING AGENDA

February 26 - 27, 2004
9:00 a.m.

04-2-1 Public Meeting to Consider a Health Update

03-9-2 Public Hearing to Consider the Adoption of the Stationary Compression Ignition Engine Airborne Toxic Control Measure

03-10-2 Public Hearing to Consider Adoption of Air-borne Toxic Control Measures (ATCM) for Transport Refrigeration Units

03-10-3 Public Hearing to Consider Amendments to the Diesel Emission Control Strategy Verification Modification Regulation

04-2-2 Public Hearing to Consider Adoption of a Proposed Airborne Toxic Control Measure for Portable Diesel-Fueled Engines

04-2-3 Public Hearing to Consider the Adoption of Proposed Amendments to the Regulation for the Statewide Portable Equip-ment Registration Program

Includes AcrobatTM ReaderTM

PC and Mac Compatible

ELECTRONIC BOARD BOOK

California Environmental Protection Agency

Air Resources Board

PUBLIC MEETING AGENDA

LOCATION:
California Environmental Protection Agency
Air Resources Board
Central Valley Auditorium, Second Floor
1001 I Street
Sacramento, CA 95814

This facility is accessible by public transit. For transit information, call: (916) 321-BUSS, website www.sacrt.com (This facility is accessible to persons with disabilities.)

February 26-27, 2004
9:00 a.m./8:30 a.m.

04-2-1 Public Meeting to Consider a Health Update

Staff will discuss a recent paper that links long-term particulate matter (PM) exposure with mortality from cardiovascular causes. In contrast to earlier similar reports that used broad cause-of-death classifications in its analysis, this new study examined specific causes of death from cardiovascular disease. With this new level of detail, this research provides epidemiological results of an association between fine PM and cause-specific cardiovascular disease deaths. The results were consistent with important physiological pathways of cardiovascular disease, such as inflammation and accelerated atherosclerosis. These results may prove useful in identifying potential mechanistic pathways of PM mortality.

03-9-2 Public Hearing to Consider the Adoption of the Stationary Compression Ignition Engine Airborne Toxic Control Measure (Continuation from the November 20, 2003, and December 11, 2003, Board Hearing)

At the November 22, 2003, and December 11, 2003, Board Hearing staff proposed emission standards, operating hour limitations, fuel requirements, and recordkeeping/reporting requirements for new and existing (installed before 1/1/05) stationary diesel-fueled compression ignition engines. Due to the Governor's Executive Order S-2-03 the Board did not vote and the record remained open. This item is being brought back before the Board to consider and vote on its possible adoption. The new and existing prime (non-emergency) engines would have to meet a stringent diesel particulate matter (PM) standard that will require the installation of diesel particulate filter technology. New emergency standby engines would have to meet the lowest diesel PM emission level currently achieved by engines meeting the U.S. Environmental Protection Agency/Air Resources Board Offroad Engine Standards. Existing emergency standby engines would have to limit maintenance and testing hours depending on the baseline emission level of the engine. Staff will be proposing additional language for demand response programs, remotely located engines and emergency standby engines located near schools.

03-10-2 Public Hearing to Consider Adoption of Airborne Toxic Control Measures (ATCM) for Transport Refrigeration Units (Continuation from the December 11, 2003, Board Hearing)

At the December 11, 2003, Board Hearing staff proposed adoption of a regulation to reduce public exposure to diesel particulate matter and other toxic air contaminants by reducing the in-use emissions from transport refrigeration units (TRU) and TRU generator sets. Due to the Governor's Executive Order S-2-03, the Board did not vote and the record remained open. This item is being brought back before the Board to discuss key issues, take further comments, and to consider and vote on its possible adoption of this ATCM.

CONTACT CLERK OF THE BOARD, 1001 I Street, 23rd Floor, Sacramento, CA 95814 (916) 322-5594
FAX: (916) 322-3928
ARB Homepage: www.arb.ca.gov

To submit written comments on an agenda item in advance of the meeting.
To request special accommodation or language needs.
TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

SMOKING IS NOT PERMITTED AT MEETINGS OF THE CALIFORNIA AIR RESOURCES BOARD

03-10-3 Public Hearing to Consider Amendments to the Diesel Emission Control Strategy Verification Modification Regulation (Continuation from the December 11, 2003, Board Hearing)

At the December 11, 2003, Board Hearing staff proposed amendments to the Diesel Emission Control Strategy Verification Procedure. Due to the Governor's Executive Order S-2-03, the Board did not vote and the record remained open. This item is being brought back before the Board to to consider and vote on its possible adoption. The four primary proposed amendments are (1) to remove coverage of damage to the vehicle/equipment from the warranty requirements, (2) to delay the effective date of the emission limit for nitrogen dioxide (NO_2) by three years, (3) to add a process for handling systems that do not appear to rely on generally accepted scientific principles, and (4) to allow a durability testing option in-line with that allowed by the U.S. Environmental Protection Agency in its verification protocol.

04-2-2 Public Hearing to Consider Adoption of a Proposed Airborne Toxic Control Measure for Portable Diesel-Fueled Engines

Staff will propose adoption of an Airborne Toxic Control Measure (ATCM) for Portable Diesel-Fueled Engines. The proposed ATCM represents an integral part of the Air Resources Board's Diesel Risk Reduction Plan, whose goal is to reduce diesel particulate matter (PM) emissions by 85 percent by 2020. Portable diesel engines are used in a variety of applications, and they emit approximately 1,500 tons per year of diesel PM. The proposed ATCM will require all portable engines to be certified to U.S. Environmental Protection Agency /Air Resources Board off-road engine standards by 2010, meet fleet-average emissions limits in 2013 and 2017, and ultimately achieve at least 85 percent control of diesel PM by 2020. The proposed ATCM will also achieve reductions in nitrogen oxides (NOx) through expedited engine replacement.

04-2-3 Public Hearing to Consider the Adoption of Proposed Amendments to the Regulation for the Statewide Portable Equipment Registration Program

Staff will propose amendments to the Regulation for the Statewide Portable Equipment Registration Program. The proposed amendments are intended to provide consistency with the proposed Airborne Toxic Control Measure for Portable Diesel-Fueled Engines, and additional clarity and enforceability.

OPEN SESSION TO PROVIDE AN OPPORTUNITY FOR MEMBERS OF THE PUBLIC TO ADDRESS THE BOARD ON SUBJECT MATTERS WITHIN THE JURISDICTION OF THE BOARD

Although no formal Board action may be taken, the Board is allowing an opportunity to interested members of the public to address the Board on items of interest that are within the Board's jurisdiction, but that do not specifically appear on the agenda. Each person will be allowed a maximum of five minutes to ensure that everyone has a chance to speak.

THOSE ITEMS ABOVE THAT ARE NOT COMPLETED ON FEBRUARY 26 WILL BE HEARD BEGINNING AT 8:30 A.M. ON FEBRUARY 27.

THE AGENDA ITEMS LISTED ABOVE MAY BE CONSIDERED IN A DIFFERENT ORDER AT THE BOARD MEETING.

California Environmental Protection Agency

Air Resources Board

PUBLIC MEETING AGENDA

LOCATION:
California Environmental Protection Agency
Air Resources Board
Central Valley Auditorium, Second Floor
1001 I Street
Sacramento, CA 95814

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February 26-27, 2004
9:00 a.m./8:30 a.m.

		Pages
04-2-1	**Public Meeting to Consider a Health Update**	----------
03-9-2	**Public Hearing to Consider the Adoption of the Stationary Compression Ignition Engine Airborne Toxic Control Measure (Continuation from the November 20, 2003, and December 11, 2003, Board Hearing)**	**5-524**
03-10-2	**Public Hearing to Consider Adoption of Airborne Toxic Control Measures (ATCM) for Transport Refrigeration Units (Continuation from the December 11, 2003, Board Hearing)**	**525-836**
03-10-3	**Public Hearing to Consider Amendments to the Diesel Emission Control Strategy Verification Modification Regulation (Continuation from the December 11, 2003, Board Hearing)**	**837-890**
04-2-2	**Public Hearing to Consider Adoption of a Proposed Airborne Toxic Control Measure for Portable Diesel-Fueled Engines**	**891-1122**
04-2-3	**Public Hearing to Consider the Adoption of Proposed Amendments to the Regulation for the Statewide Portable Equipment Registration Program**	**1123-1250**

CONTACT CLERK OF THE BOARD, 1001 I Street, 23rd Floor, Sacramento, CA 95814 **(916) 322-5594**
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SMOKING IS NOT PERMITTED AT MEETINGS OF THE CALIFORNIA AIR RESOURCES BOARD

NOTICE OF RECALENDARING OF RULEMAKING ACTIONS

TITLE 13. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER AMENDMENTS TO THE VERIFICATION PROCEDURE, WARRANTY AND IN-USE COMPLIANCE REQUIREMENTS FOR IN-USE STRATEGIES TO CONTROL EMISSIONS FROM DIESEL ENGINES (VERIFICATION PROCEDURE)

NOTICE OF PUBLIC HEARING TO CONSIDER THE ADOPTION OF PROPOSED AIRBORNE TOXIC CONTROL MEASURE FOR IN-USE DIESEL-FUELED TRANSPORT REFRIGERATION UNITS (TRU) AND TRU GENERATOR SETS, AND FACILITIES WHERE TRUs OPERATE (TRU ATCM)

TITLE 17. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER THE ADOPTION OF A PROPOSED AIRBORNE TOXIC CONTROL MEASURE FOR STATIONARY COMPRESSION IGNITION ENGINES (STATIONARY ENGINE ATCM)

The Air Resources Board (the Board or ARB) will conduct a public hearing at the time and place noted below to renew consideration of the above regulations that were initially considered in November and December of 2003, but for which the Board delayed final action on the regulations in consideration of Executive Order S-2-03.

DATE: February 26, 2004

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Central Valley Auditorium
1001 "I" Street
Sacramento, CA 95814

The items will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., February 26, 2004, and may continue at 8:30 a.m., February 27, 2004. The items may not be considered until February 27, 2004. Please consult the agenda for the meeting, which will be available at least 10 days before February 26, 2004, to determine the day on which these items will be considered.

If you have special accommodation or language needs, please contact the ARB's Clerk of the Board at (916) 322-5594 or amalik@arb.ca.gov as soon as possible. TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

INFORMATIVE DIGESTS OF PROPOSED ACTIONS AND POLICY STATEMENT OVERVIEWS

Please refer to the original notices for these items for the informative digests of the proposed actions and the policy statement overviews. These are available on the ARB's rulemaking web site listed below. The notices are also available from the contact persons given below.

COMPARABLE FEDERAL REGULATIONS

Please refer to the original notices for the comparable federal regulations.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

The ARB staff has prepared Staff Reports: Initial Statements of Reasons (ISOR) for the proposed regulatory actions, which include summaries of the environmental and economic impacts of the proposals.

Copies of the ISORs and the full texts of the proposed regulatory language may be accessed on ARB's web sites listed below, or may be obtained from ARB's Public Information Office, Environmental Services Center, 1001 "I" Street, First Floor, Sacramento, CA 95814, (916) 322-2990.

Upon their completion, the Final Statements of Reasons (FSORs) will also be available and copies may be requested from the agency contact persons in this notice, or may be accessed on the web site listed below.

Inquiries concerning the substance of the proposed amendments for the Verification Procedure may be directed to the designated agency contact persons, Mr. Paul Henderick or by email at phenderi@arb.ca.gov , Air Resources Engineer, Retrofit Assessment Section, at (626) 350-6440, or Mr. Scott Rowland, Manager, Retrofit Assessment Section, at (626) 575-6972 or by email at srowland@arb.ca.gov .

Inquiries concerning the substance of the proposed regulations for the TRU ATCM may be directed to the designated agency contact persons, Tony Andreoni, Manager of the Process Evaluation Section, Emission Assessment Branch, Stationary Source Division at (916) 324-6021 or by email at tandreon@arb.ca.gov, or Rod Hill, Air Resources Engineer, Stationary Source Division at (916) 323-0440 or by email at rhill@arb.ca.gov .

Inquiries concerning the substance of the proposed regulations for the Stationary Engine ATCM may be directed to the designated agency contact persons, Peggy Taricco, Manager of the Technical Analysis Section, at (916) 327-7213 or by email at ptaricco@arb.ca.gov, or Alex Santos, Staff Air Pollution Specialist, at (916) 327-5638 or by email at asantos@arb.ca.gov.

Further, the agency representative and designated back-up contact persons to whom non-substantive inquiries concerning the proposed administrative action may be directed are Artavia Edwards, Manager, Board Administration & Regulatory Coordination Unit, (916) 322-6070, or Alexa Malik, Regulations Coordinator, (916) 322-4011. The Board staff has compiled records for the rulemaking actions, which includes all information upon which the proposals are based. This material is available for inspection upon request to the contact persons.

If you are a person with a disability and desire to obtain this document in an alternative format, please contact the ARB's Clerk of the Board at (916) 322-5594 or amalik@arb.ca.gov as soon as possible. TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

The notices, the ISORs, and all subsequent regulatory documents, including the FSORs when completed, will be available on the ARB Internet site for the rulemaking at the following web sites:
for the Verification Procedure:
http://www.arb.ca.gov/regact/verpro03/verpro03.htm
for the TRU ATCM:
http://www.arb.ca.gov/regact/trude03/trude03.htm
for the Stationary Engine ATCM:
http://www.arb.ca.gov/regact/statde/statde.htm

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

Please refer to the original notices for the costs to public agencies and to businesses and persons affected.

SUBMITTAL OF COMMENTS

The comment periods remain open for comments not already submitted to the ARB on the recalendared rulemaking actions. The public may present comments relating to these matters orally or in writing at the hearing, and in writing or by e-mail before the hearing. To be considered by the Board, written submissions must be received by **no later than 12:00 noon, February 25, 2004** and addressed to the following:

Postal Mail is to be sent to:

Clerk of the Board
Air Resources Board
1001 "I" Street, 23rd Floor
Sacramento, California 95814

Electronic mail is to be sent as follows:
for the Verification Procedures to verpro03@listserv.arb.ca.gov,
for the TRU ATCM to trude03@listserv.arb.ca.gov ,
and for the Stationary Engine ATCM to : statde@listserv.arb.ca.gov .
Electronic mail is to be received at the ARB **no later than 12:00 noon, February 25, 2004.**

Facsimile submissions are to be transmitted to the Clerk of the Board at (916) 322-3928 and received at the ARB **no later than 12:00 noon, February 25, 2004.**

The Board requests, but does not require, that 30 copies of any written statement be submitted at least 10 days prior to the hearing so that ARB staff and Board Members have time to fully consider each comment. The ARB encourages members of the public to bring to the attention of the staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

STATUTORY AUTHORITY AND REFERENCES

Please refer to the original notices for the statutory authority and references.

HEARING PROCEDURES

Please refer to the original notices for the hearing procedures.

CALIFORNIA AIR RESOURCES BOARD

Michael H Scheible

for Catherine Witherspoon
Executive Officer

Date: January 28, 2004

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs see our Web-site at www.arb.ca.gov.

TITLE 17. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER THE ADOPTION OF A PROPOSED AIRBORNE TOXIC CONTROL MEASURE FOR STATIONARY COMPRESSION IGNITION ENGINES

The Air Resources Board (ARB or Board) will conduct a public hearing at the time and place noted below to consider adopting an airborne toxic control measure (ATCM) to reduce public exposure to diesel particulate matter (PM) and to control criteria pollutants emitted from stationary diesel-fueled, compression-ignition engines (stationary diesel engines). The control measure would reduce diesel PM and control criteria pollutant emissions through a combination of limits on annual operating hours and application of best available control technology. Owners, operators, sellers, buyers, and long-term renters of stationary diesel engines would be subject to and have responsibilities under the control measure. This notice summarizes the proposed control measure. The staff report presents the control measure in greater detail.

DATE: November 13, 2003

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Central Valley Auditorium, Second Floor
1001 I Street
Sacramento, California 95814

This item will be considered at a two-day meeting of the ARB, which will commence at 9:00 a.m., November 13, 2003, and may continue at 8:30 a.m., November 14, 2003. This item may not be considered until November 14, 2003. Please consult the agenda for the meeting, which will be available at least 10 days before November 13, 2003, to determine the day on which this item will be considered.

If you have special accommodation or language needs, please contact the ARB's Clerk of the Board at (916) 322-5594 or sdorais@arb.ca.gov as soon as possible. TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed adoption of new section 93115, title 17, California Code of Regulations (CCR). The following documents are incorporated herein by reference: (1) American Society for Testing and Materials (ASTM) Standards D 613-03b, D 975-03, D 1655-02 ; (2) *Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines*, dated October 2000; (3) Air Force Space Command Instruction 21-0114, dated March 27, 2000; (4) Office of the Chief of Naval Operations (OPNAV)

Instruction 1500.51B, dated March 31, 1989; (5) Military Specifications MIL-DTL-5624T, dated September 18, 1998, and MIL-T-83133E, dated April 1, 1999; (6) *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines*, 13 CCR 2700-2710; (7) *Exhaust Emission Standards and Test Procedures – Off-Road Compression-Ignition Engines,* 13 CCR 2423; (8) National Fire Protection Association (*NFPA) 25 - Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* 1998; (9) 2001 California Building Code, 24 CCR Part 2, Vol. 2, Chapter 35 (Uniform Building Code Standards); (10) California Air Resources Board (ARB) Method 5, *Determination of Particulate Matter Emissions from Stationary Sources,* as amended July 28, 1997; (11) California Air Resources Board (ARB) Method 100, *Procedures for Continuous Gaseous Emission Stack Sampling,* as amended July 28, 1997; and (12) International Organization for Standardization (ISO) Methods 8178-1:1996(E), 8178-2:1996(E), and 8178-4:1996(E).

Background

The California Toxic Air Contaminant Identification and Control Program (Program), established under California law by Assembly Bill 1807 (Stats. 1983, Ch. 1047) and set forth in Health and Safety Code (H&SC) sections 39650–39675, requires the ARB to identify and control air toxicants in California. In 1998, the Board identified diesel particulate matter as a toxic air contaminant (TAC) with no Board-specified threshold exposure level.

Following the identification of a substance as a TAC, H&SC section 39665 requires the ARB, with participation of the air pollution control and air quality management districts (districts) and in consultation with affected sources and interested parties, to prepare a report on the need and appropriate degree of regulation for that substance. H&SC section 39665(b) requires that this "needs assessment" address, among other things, the technological feasibility of proposed ATCMs and the availability, suitability, and relative efficacy of substitute products or processes of a less hazardous nature.

A needs assessment for diesel PM was conducted between 1998 and 2000, which resulted in the ARB's development of the Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles (Diesel RRP). The Diesel RRP presented information that identified the available options for reducing diesel PM and recommended control measures to achieve further reductions. The scope of the Diesel RRP was broad, addressing all categories of engines, both mobile and stationary. For stationary diesel engines, the Diesel RRP identified and recommended the development of this proposed ATCM. ARB staff has prepared an Initial Statement of Reasons (ISOR or staff report) for the proposed ATCM that, together with the Diesel RRP, serves as the report on the need and appropriate degree of regulation for the proposed ATCM.

Once the ARB has evaluated the need and appropriate degree of regulation for a TAC, H&SC section 39666(c) requires the ARB to adopt regulations (ATCMs) to reduce

emissions of the TAC to the lowest level achievable through the application of best available control technology (BACT) or a more effective control method, in consideration of cost, risk, environmental impacts, and other specified factors. In developing the proposed ATCM, State law also requires an assessment of the appropriateness of substitute products or processes.

Stationary diesel engines emit approximately 910 tons per year of diesel PM. These engines are distributed throughout California, and many are located in urban centers where the population is exposed to diesel PM emissions. The proposed ATCM is designed to minimize the public's exposure to diesel PM by establishing stringent operational requirements and emission limits for these engines.

In addition to emitting TACs, stationary diesel engines also emit criteria pollutants such as oxides of nitrogen (NOx), oxides of sulfur (SOx), carbon monoxide (CO), and non-methane hydrocarbons (NMHC). Emissions of these criteria pollutants contribute to violations of applicable California and national ambient air quality standards (CAAQS and NAAQS, respectively). To control criteria pollutant emissions, H&SC section 43013(b) directs the ARB to adopt standards and regulations for nonvehicle engine categories, including but not limited to construction equipment, farm equipment, and utility engines. Because they are nonvehicle engines, stationary diesel engines subject to the proposed ATCM are covered by this mandate.

Description of the Proposed Regulatory Action

Applicability

With enumerated exceptions, the proposed ATCM would apply to any person who owns, operates, sells, offers for sale, leases, or buys a regulated stationary diesel engine for use in California. In general, a stationary diesel engine is one that remains in one location at a facility for more than 12 months. A new engine is one that is installed after January 1, 2005, while an in-use engine is one that is installed prior to January 1, 2005. The proposed ATCM has separate provisions for engines that are no more than 50 brake horsepower (bhp) and engines that are greater than 50 bhp.

Initial and Annual Reporting Requirements

Owners and operators of existing stationary diesel engines rated greater than 50 bhp would be required to submit to the air districts specified information regarding their engines' make, model, fuel use, general use of the engine, and hours of operation. This information would be due no later than July 1, 2005.

Sellers of stationary diesel engines that are less than or equal to 50 bhp or engines used in agricultural operations would be required to submit to the ARB information identifying the types of engines sold and the number of engines sold per year. This information would be due no later than January 1, 2006 and annually thereafter for the prior year.

Bifurcated Standards and Requirements Based on Horsepower

For new engines that are less than or equal to 50 bhp, the ATCM requires compliance with the current Off-Road Compression Ignition Engine Standards (Title 13 CCR Section 2423) applicable to an engine of the same brake horsepower rating and model year. These standards represent best available control technology for this category of engines. The ATCM would not require retrofits for any in-use engines in this horsepower category.

For engines that are greater than 50 bhp, the proposed ATCM establishes different requirements for emergency standby engines and prime engines, which are engines used in non-emergency applications. Separate requirements are also established for engines used in agricultural operations.

Clean Fuel Use Requirement

By January 1, 2005, all stationary diesel engines greater than 50 bhp would be required to use either CARB diesel or a "clean" alternative, which includes CARB diesel/CNG (compressed natural gas) dual-fuel systems and alternative diesel fuels that have met the requirements of the ARB's Verification Procedure (Title 13 CCR 2700-2710).

Requirements for Emergency Standby Engines

An emergency standby engine is used to provide power during an electrical power outage; to provide for the emergency pumping of water during a flood or for fire suppression; or to power high-power, airport runway lights under low-visibility conditions. Because emergencies are generally infrequent, an emergency standby engine mostly operates during scheduled maintenance and testing periods. Rather than limiting the hours of engine operation during an emergency, the proposed ATCM would establish different diesel PM standards for both new and in-use emergency standby engines based on the number of maintenance and testing hours these engines are operated annually.

To provide flexibility for engine owners while ensuring that public exposure to diesel PM is minimized, the tiered diesel PM standards become more stringent as the annual hours of maintenance and testing operation increase. For example, an in-use engine that emit between 0.15 and 0.4 grams diesel PM per brake horsepower-hour (g/bhp-hr) would be permitted to run up to 30 hours annually for maintenance and testing. By contrast, an in-use engine that emits more than 0.40 g/bhp-hr would be permitted only 20 hours annually for maintenance and testing.

In addition to the diesel PM limits, the proposed ATCM would restrict criteria pollutant emissions by requiring new emergency standby engines to meet current Off-Road Compression Ignition Engine Standards. The ATCM would also prohibit in-use emergency standby engines from increasing criteria pollutant emissions when controlling diesel PM emissions.

Requirements for Prime Engines

A prime diesel engine can be used in a wide variety of non-emergency applications. These include remote power generation, cranes, sand and gravel processing, and the pumping of fluids. Prime engines typically operate many more hours per year than emergency standby engines. Because of this, the ATCM would require prime engines to meet much more stringent emission limits than emergency standby engines. New prime engines would be limited to 0.01 g/bhp-hr of diesel PM, while in-use prime engines (that are off-road certified) would need to either meet the 0.01 g/bhp-hr standard or reduce diesel PM emissions by 85 percent from baseline levels. In-use prime engines that are not off-road certified would be given the option of either meeting the 0.01 g/bhp-hr standard or reducing diesel PM emissions by 30 percent (relative to baseline levels) by 2005 then replacing the engine in 2013 with an engine that emits no greater than 0.01 g/bhp-hr.

As with the requirements for emergency engines, the proposed ATCM restricts the criteria pollutant emissions by requiring new prime engines to meet current Off-Road Compression Ignition Engine Standards. In-use prime engines would be prohibited from increasing criteria pollutant emissions when controlling diesel PM. Because the ATCM focuses on applying best available control technology to prime engines, it does not limit the number of hours new and in-use prime engines may operate.

Requirements for Engines Used in Agricultural Operations

The proposed ATCM also establishes separate diesel PM emission limits for new stationary diesel engines used in agricultural operations. These engines would be limited to diesel PM emissions of no greater than 0.15 g/bhp-hr. To control criteria pollutants, new agricultural engines would need to meet the Off-Road Compression Ignition Engine Standards applicable to engines of the same size and model year. In this proposal, the ATCM would not apply restrictions to in-use engines in agricultural operations. However, the ARB staff will continue investigating retrofit controls and other opportunities for future emission reductions from these engines.

Exemptions and Other Provisions

The proposed ATCM establishes a number of exemptions from some or all of the operational requirements and emission limits discussed in the previous paragraphs. The proposed ATCM also contains sections addressing recordkeeping and reporting, monitoring equipment, compliance schedules, definitions, emissions data, and test methods.

There are no federal regulations that are comparable to the proposed ATCM.

Additional Provisions Under Consideration

The ARB staff is currently considering language that would address diesel PM and criteria pollutants from stationary diesel engines operating under interruptible service contracts (ISC). Some engine owners have entered into ISCs with electric utilities to reduce their electrical demand when requested by the utilities in exchange for reduced electricity prices or other non-monetary consideration. Provisions to address these engines have been considered in prior workshops, but the exact language has not yet been developed. ARB staff will continue further development of such language during the 45-day comment period leading up to the Board hearing starting on November 13, 2003. If the provisions are finalized by that time, the ARB staff will present such language as a modification to the proposed ATCM for the Board's consideration at the hearing. As described below, an additional 15-day comment period will then be provided if the Board adopts either the ISC language proposed by ARB staff or a different version.

The ARB staff is also considering language that would define violations of the ATCM requirements and specify the applicable penalties. If the violation and penalties provisions are finalized before the Board hearing, the ARB staff will present such language as a modification to the proposed ATCM for the Board's consideration at the hearing. As noted previously, an additional 15-day comment period will then be provided if the Board adopts either the violations and penalties provision proposed by ARB staff or a different version.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

The Board staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes a summary of the potential environmental and economic impacts of the proposal, if any. The ISOR is entitled, "Staff Report: Initial Statement of Reasons for the Proposed Airborne Toxic Control Measure for Stationary CI Engines."

Copies of the ISOR and the full text of the proposed regulatory language may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, CA 95814, (916) 322-2990 at least 45 days prior to the scheduled hearing which will begin on November 13, 2003.

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons in this notice, or may be accessed on the web site listed below.

Inquiries concerning the substance of the proposed regulations may be directed to the designated agency contact persons, Peggy Taricco, Manager of the Technical Analysis Section, at (916) 327-7213 or by email at ptaricco@arb.ca.gov, or Alex Santos, Staff Air Pollution Specialist, at (916) 327-5638 or by email at asantos@arb.ca.gov.

Further, the agency representative and designated back-up contact persons to whom nonsubstantive inquiries concerning the proposed administrative action may be directed are Artavia Edwards, Manager, Board Administration & Regulatory Coordination Unit, (916) 322-6070, and Alexa Malik, Regulations Coordinator, (916) 322-4011. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

If you are a person with a disability and desire to obtain this document in an alternative format, please contact the Air Resources Board ADA Coordinator at (916) 323-4916, or TDD (916) 324-9531, or (800) 700-8326 for TDD calls from outside the Sacramento area.

This notice, the ISOR and all subsequent regulatory documents, including the FSOR, when completed, are available on the ARB Internet site for this rulemaking at http://www.arb.ca.gov/regact/statde/statde.htm.

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies and private persons and businesses in reasonable compliance with the proposed regulations are presented below.

Pursuant to Government Code sections 11346.5(a)(5) and 11346.5(a)(6), the Executive Officer has determined that the proposed regulatory action will not create costs or savings to any state agency or in federal funding to the state, costs or mandate to any local agency or school district whether or not reimbursable by the state pursuant to Part 7 (commencing with section 17500), Division 4, Title 2 of the Government Code, except as discussed below, or other nondiscretionary savings to state or local agencies.

While there are no impacts for fiscal years (FYs) 2003 and 2004, the proposed ATCM will impose a mandate upon and create costs to some local agencies for fiscal year 2005 and beyond. For FYs 2005-2009, local agencies operating diesel engines regulated under the proposed ATCM will need to spend approximately $1.10 million per year. These costs are not reimbursable state mandated costs pursuant to Part 7 (commencing with section 17500), Division 4, Title 2 of the Government Code because most, if not all, of these agencies are authorized to collect fees to recoup their costs under Section 17500, et seq., of the Government Code, and the ATCM applies to all entities that own or operate stationary diesel engines and, therefore, does not impose unique requirements on local government agencies.

The Executive Officer has also determined that State government agencies with regulated engines will not incur costs during FYs 2003 and 2004. However, it is anticipated that State agencies will incur an annualized cost of about $20,600 per year for FYs 2005 through 2009. This is the aggregate cost for all affected State agencies and represents the annualized capital cost and annual recurring cost savings from

reduced fuel use. Given the current fiscal and economic conditions, the Executive Officer cannot determine with certainty whether State agencies will be able to absorb these additional costs within current or future budgets, but it is anticipated that the agencies will be able to absorb annualized costs of this magnitude.

The Board's Executive Officer has also determined that individual local air districts may incur some permitting and enforcement costs as a result of implementing the proposed ATCM. However, the costs incurred by the air districts are not reimbursable state mandated costs because of the districts' authority to recover the costs through fee assessments authorized under H&SC sections 41512 and 42311.

In developing this regulatory proposal, the ARB staff evaluated the potential economic impacts on representative private persons or businesses. The ARB is not aware of any cost impacts that a representative private person or business would necessarily incur in reasonable compliance with the proposed action.

The Executive Officer has made an initial determination that the proposed regulatory action will not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed regulatory action will not affect the creation or elimination of jobs within the State of California, the creation of new businesses or elimination of existing businesses within the State of California, or the expansion of businesses currently doing business within the State of California.

The Executive Officer has also determined, pursuant to title 1, CCR, section 4, that the proposed regulatory action will have some impact, although not significant, on small businesses that own or operate affected stationary diesel engines. During the initial years of implementation, the increased cost of equipment may lead to lower profits for some small businesses, primarily those operating prime engines.

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the ARB's Executive Officer has found that the reporting requirements of the regulation that apply to businesses are necessary for the health, safety, and welfare of the people of the State of California.

In accordance with H&SC 43013(c), the Executive Officer has determined that the standards and other requirements in the proposed ATCM are necessary, cost-effective, and technologically feasible for stationary diesel engines used in agricultural operations (i.e., farm equipment).

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the agency or that has otherwise been identified and brought to the attention of the agency would be more effective in carrying

out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action.

A detailed assessment of the economic impacts of the proposed regulatory action can be found in the Staff Report.

SUBMITTAL OF COMMENTS

The public may present comments relating to this matter orally or in writing at the hearing, and in writing or by e-mail before the hearing. To be considered by the Board, written submissions must be received **no later than 12:00 noon, November 12, 2003**, and addressed to the following:

Postal mail is to be sent to:

Clerk of the Board
Air Resources Board
1001 I Street, 23rd Floor
Sacramento, California 95814

Electronic mail is to be sent to: statde@listserv.arb.ca.gov, and received at the ARB **no later than 12:00 noon, November 12, 2003**.

Facsimile submissions are to be transmitted to the Clerk of the Board at (916) 322-3928 and received at the ARB **no later than 12:00 noon, November 12, 2003**.

The Board requests but does not require 30 copies of any written submission. Also the ARB requests that written, facsimile, and e-mail statements be filed at least 10 days prior to the hearing so that ARB staff and Board Members have time to fully consider each comment. The ARB encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under the authority granted to the ARB in Health and Safety Code sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013. This action is proposed to implement, interpret, or make specific Health and Safety Code sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, Title 2, Division 3, Part 1, Chapter 3.5 (commencing with section 11340) of the Government Code.

Following the public hearing, the ARB may adopt the regulatory language as originally proposed or with non-substantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice that the regulatory language as modified could result from the proposed regulatory action. In the event that such modifications are made, the full regulatory text, with the modifications clearly indicated, will be made available to the public for written comment at least 15 days before it is adopted.

The public may request a copy of the modified regulatory text from the ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, California 95814, (916) 322-2990.

CALIFORNIA AIR RESOURCES BOARD

Catherine Witherspoon
Executive Officer

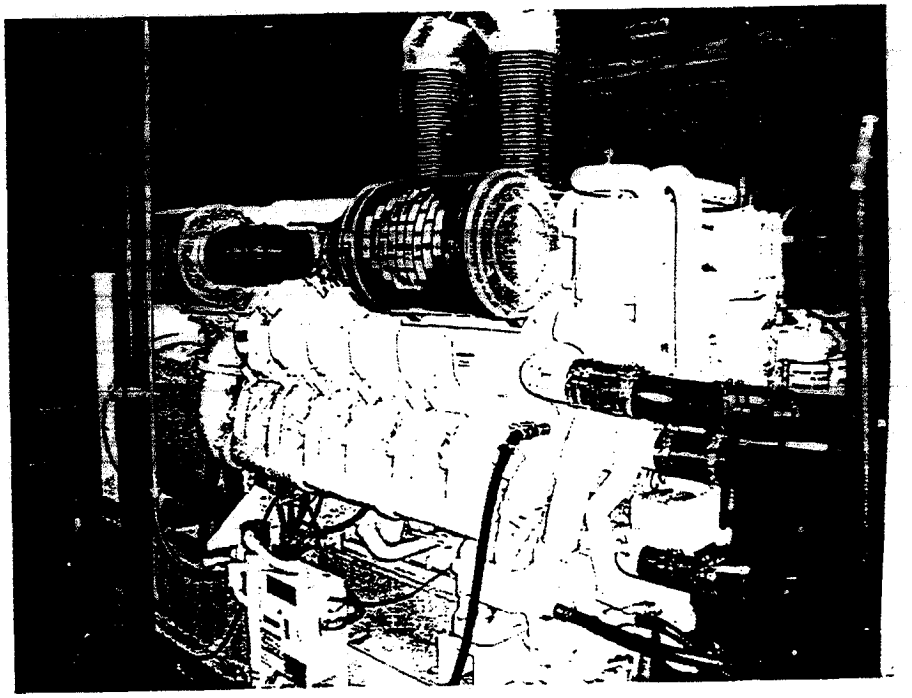
Date: September 16, 2003

"The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our Web-site at www.arb.ca.gov."

California Environmental Protection Agency

AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING



AIRBORNE TOXIC CONTROL MEASURE FOR STATIONARY COMPRESSION-IGNITION ENGINES

Stationary Source Division
Emissions Assessment Branch

September 2003

State of California
AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

Public Hearing to Consider

ADOPTION OF THE PROPOSED AIRBORNE TOXIC CONTROL MEASURE FOR STATIONARY COMPRESSION-IGNITION ENGINES

To be considered by the Air Resources Board on November 13-14, 2003, at:

California Environmental Protection Agency
Headquarters Building
1001 "I" Street
Central Valley Auditorium
Sacramento, California

Stationary Source Division:
Peter D. Venturini, Chief
Robert D. Barham, Assistant Chief
Emissions Assessment Branch:
Daniel E. Donohoue, Chief
Technical Analysis Section:
Peggy Taricco, Manager

This report has been prepared by the staff of the Air Resources Board. Publication does not signify that the contents reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

State of California
AIR RESOURCES BOARD

PROPOSED AIRBORNE TOXIC CONTROL MEASURE FOR STATIONARY COMPRESSION-IGNITION ENGINES

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Acknowledgements

This report was prepared with the assistance and support from the other divisions and offices of the Air Resources Board. In addition, we would like to acknowledge the assistance and cooperation that we have received from many individuals and organizations.

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EXECUTIVE SUMMARY

The Air Resources Board (ARB or Board), in addition to maintaining long-standing efforts to reduce emissions of ozone precursors, is now challenged to reduce emission of diesel particulate matter. In 1998, the Board identified diesel particulate matter (diesel PM) as a toxic air contaminant (TAC). Because of the amount of emission to California's air and its potency, diesel PM is by far the number one contributor to the adverse health impacts of TACs.

Diesel exhaust is a complex mixture of thousands of gases and fine particles that contains more than 40 identified TACs. These include many known or suspected cancer-causing substances, such as benzene, arsenic and formaldehyde. In addition to increasing the risk of lung cancer, exposure to diesel exhaust can have other health effects as well. Diesel exhaust can irritate the eyes, nose, throat and lungs, and it can cause coughs, headaches, light-headedness and nausea. Diesel exhaust is a major source of fine particulate pollution as well and numerous studies have linked elevated particle levels in the air to increased hospital admissions, emergency room visit, asthma attacks and premature deaths among those suffering from respiratory problems.

To reduce public exposure to diesel PM, the Board approved in 2000 the Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles (Diesel Risk Reduction Plan). This comprehensive plan outlined steps to reduce diesel emissions from both new and existing diesel-fueled engines and vehicles. The goal of the Diesel Risk Reduction Plan is to reduce diesel PM emissions and associated potential cancer risks by 75 percent in 2010 and by 85 percent by 2020.

As part of the effort to reduce diesel PM, ARB staff is proposing an airborne toxic control measure (ATCM) to reduce diesel PM emissions from stationary diesel-fueled compression ignition engines. The proposed ATCM is one of many ATCMs that will be considered by the ARB over the next several months to fulfill the goals of the Diesel Risk Reduction Plan. The ATCMs being proposed include ATCMs to reduce emissions from residential and commercial solid waste collection vehicles, fuel cargo delivery trucks, transport refrigeration units, and portable engines.

Presented below is an overview which briefly discusses the emissions from new and existing stationary engines, the proposed ATCM and the potential impacts from implementation as well as what our plans are for future activities. For simplicity, the discussion is presented in question-and-answer format using commonly asked questions about the ATCM. It should be noted that this summary provides only brief discussion on these topics. The reader is directed to subsequent chapters in the main body of the report for more detailed information.

1. What is ARB staff proposing?

ARB staff is proposing an ATCM that will limit the emissions of diesel PM from many new and existing stationary diesel-fueled compression ignition (CI) engines. Unlike diesel-fueled CI engines used in on- and off-road applications, diesel-fueled engines used in stationary applications are currently not required to meet state or federal engine certification standards. Under Title I of the Federal Clean Air Act, states are fully authorized to establish standards for stationary engines, and these engines are not affected by Section 209(e) provisions of the Act, which may require a waiver from the United States Environmental Protection Agency (U.S. EPA) when establishing requirements for mobile non-road engines.

The proposed ATCM establishes emission standards, including a standard for diesel PM emissions, that sellers of stationary diesel-fueled engines would have to meet. The proposed ATCM also establishes emission standards and operational requirements that the owners or operators of stationary diesel-fueled CI engines that have a rated horsepower rating of greater than 50, would have to meet. The requirements can be grouped into three general categories: fuel use requirements, operational requirements and emission standards, and recordkeeping, reporting, and monitoring requirements. The proposed ATCM will also require specified classes of stationary engines to meet the off-road engine standards in title 13, California Code of Regulations (CCR), section 2423 for other pollutants that contribute to ground-level smog. In general, the goal of these requirements is to have the owners and operators of diesel-fueled engines use the cleanest fuels possible, limit the unnecessary operation of their engines, and control the emissions of diesel PM to the greatest extent possible, in consideration of technical and economic feasibility.

2. How did ARB staff develop the ATCM and this report?

The staff developed the proposed ATCM and this report through extensive consultations with industry, government agency representatives, environmental organizations, and members of the public. Over the course of two and a half years, the staff held 10 public workshops and meetings covering numerous drafts, regulatory concepts, and implementation issues. Participating in one or more of the workshops were representatives of local publicly-owned treatment works (POTWs), the California Council for Economic and Environmental Balance (CCEEB), agricultural community representatives, the Association of California Water Agencies, the American Lung Association, the Engine Manufacturers Association, Manufacturers of Emission Controls Association, National Resources Defense Counsel, Environmental Defense, the United States Navy, private businesses and others. Staff also met bimonthly with the California Air Pollution Control Officers Association's Toxics Committee to gain the perspective and input of local air pollution control or air quality management district representatives. Numerous individual meetings were held with affected stakeholders, and staff also researched the literature to better understand retrofit control technologies available to reduce diesel PM emissions from stationary diesel-fueled engines. To further investigate the feasibility of retrofit controls, ARB funded a demonstration

program to evaluate and demonstrate diesel PM control technologies for emergency back-up engines and to investigate test methods that can be used to measure PM from stationary engines.

3. What businesses and public agencies will be affected by the proposed ATCM?

Both private businesses and public agencies operating stationary diesel-fueled engines in California will be affected by the proposed ATCM. Examples of businesses that potentially will be affected include private schools and universities, private water treatment facilities, hospitals, power generation, communications, broadcasting, building owners, agricultural production, banks, hotels, refiners, resorts, recycling centers, quarries, wineries, dairies, food processing, and manufacturing entities. A variety of public agencies will also be affected including military installations, prisons and jails, public schools and universities, and public water and wastewater treatment facilities.

4. What are stationary compression ignition engines?

Stationary compression ignition engines (stationary engines) are engines that remain in one location for 12 months or longer. ARB staff estimates there are about 26,300 stationary diesel-fueled engines operating in California. Stationary engines are typically categorized as either prime engines or emergency standby engines. The majority of the engines, approximately 75 percent or 19,700, are used in emergency standby applications, while the remaining 6,600 engines are considered prime engines. Emergency standby engines are typically used for emergency back-up electric power generation or the emergency pumping of water. Prime engines are stationary engines that are not used in an emergency backup or standby mode. They can be used in a variety of applications including agricultural irrigation, compressors, cranes, and rock crushers. Prime engines can operate several hundred hours per year (i.e., small seasonal rock crushing operations) to several thousand hours per year (i.e., stationary cranes at ports/ship yards).

5. What are the emissions, exposures, and risk from stationary diesel-fueled engines?

Stationary engines are used in a variety of applications and are located throughout the State. ARB staff estimates stationary diesel engines emit approximately 2.6 tons per day or 950 tons per year of diesel PM emissions, 40 tons per day of oxides of nitrogen (NOx), and 6 tons per day of reactive organic gases (ROG) in 2002. Based on an average statewide NOx to PM conversion factor, we estimate the secondary formation of PM_{10} nitrate from NOx emissions from diesel-fueled stationary engines to be about four tons per day.

Prime engines account for the majority, about 90 percent, of diesel PM emissions. When all sources of diesel PM are considered, stationary engines account for about four percent of the total diesel PM emissions in California. Because ambient air

monitoring techniques for diesel PM are still under development, it is difficult to measure the actual exposures to persons from the emissions of stationary diesel-fueled engines. However, because the engines are distributed throughout California and many of the engines are located in urban centers where the probability of a person living close to an engine is higher, we believe that many Californians are impacted by diesel PM emissions from the operation of stationary diesel-fueled engines in California.

Exposure to these emissions results in increased cancer risk and health risks from other non-cancer health impacts, such as irritation to the eyes and lungs, allergic reactions in the lungs, asthma exacerbation, blood toxicity, immune system dysfunction, and developmental disorders. Because monitoring results are not available for diesel PM, estimates of the level of cancer risk are made using emission factors and various modeling techniques. Based on a health risk assessment, using reasonable assumptions bracketing a fairly broad range of possible operating and exposure scenarios for stationary engines, we determined that exposures to the diesel PM emissions from stationary diesel-fueled engines can result in significant near source risks. For example, a typical emergency standby engine operating 100 hours a year for maintenance and testing can result in a potential cancer risk of over 30 potential cancer cases in a million for a nearby residence. A similar engine operating in a prime mode for 2000 hours a year can result in a cancer risk of over 650 potential cancer cases in a million. These risk values assume exposure duration of 70 years for a nearby individual.

6. What does the proposed ATCM require?

The proposed ATCM establishes requirements that affect the sellers, owners, and operators of diesel-fueled CI engines that are used in stationary applications. As required by State law, our approach in developing the emission standards and operational limits was to establish requirements that are based on the application of the best available control technology (BACT) and operational practices for diesel PM. The following paragraphs summarize the key requirements of the proposed ATCM.

<u>Initial Reporting Requirements</u>

- Owners or operators of existing stationary CI engines having a horsepower rating greater than 50 (> 50 hp) are required to submit information to the local air districts identifying each engine's make and model, fuel and fuel usage rate, general use and typical hours of operation. This information is due to the districts no later than July 1, 2005.
- Sellers of stationary diesel-fueled engines that are to be used in agricultural applications (i.e., pumps), or that have a rated horsepower of less than or equal to 50 ($\leq$ 50), are required to submit to the ARB information identifying the types of engines sold and number of engines sold per year. This information is due to the ARB no later than January 1, 2006, and annually thereafter for the prior calendar year.

Fuel Use Requirements

- By January 1, 2005, all stationary diesel-fueled CI engines > 50 hp are required to use CARB diesel or a "clean" alternative. "Clean" alternative fuels include CARB diesel/CNG dual-fuel systems and alternative diesel fuels that have met the requirements of the ARB's Verification Procedure.

Emission Standards and Operating Requirements

The proposed diesel PM emission standards and operation limits for new and in-use stationary diesel-fueled engines are briefly discussed below and summarized in Tables E-1 and E-2.

- The proposed ATCM establishes emission standards for stationary diesel-fueled CI engines ≤ 50 hp, sold for use in California. BACT for these engines is the applicable Off-Road Engine PM Certification Standard in title 13, CCR, section 2423.
- For stationary diesel-fueled CI engines > 50 hp used in emergency standby applications (e.g., emergency generator sets and fire pumps), BACT consists of specific diesel PM emission standards and limits on the number of hours the engine must meet more stringent operate for maintenance and testing purposes. Generally, new engine applications must more stringent standards than in-use engine applications. As permitted under State law, the local air pollution control districts may establish more stringent alternative emission standards and hour limitations, on a site-specific basis.
- For stationary diesel-fueled CI engines > 50 hp used in prime applications (e.g., shipyard cranes and rock crushers), BACT consists of specific diesel PM emission standards. New engine applications are held to more stringent standards than in-use engine applications. In-use engines that are not certified off-road engines and for which highly effective PM retrofit controls are unavailable have the option of reducing diesel PM emissions by 30 percent in the near term and meeting a 0.01 g/bhp-hr (proposed Tier 4) PM emission standard in 2011. As permitted under State law, the local air pollution control districts may establish more stringent alternative emission standards and hour limitations.
- The proposed ATCM establishes emission standards for new stationary diesel-fueled CI engines sold for use in agricultural operations. BACT for these engines is 0.15 g/bhp-hr or the applicable Off-Road Engine PM Certification standard, whichever is more stringent.
- For new engines, both ≤ 50 and > 50 hp, the requirements are effective as of July 1, 2005. Owners and operators of in-use engines that elect to comply by reducing hours of operation must do so by January 1, 2005. For in-use engines that require the installation of add-on controls, the requirements are phased in over a four-year period (2006 to 2009), depending on the age and number of engines an owner has.

Table E-1: Summary of Proposed Diesel PM Standards and Operating Limits for New Engines

Engine Applications	Diesel PM Emission Limit (g/bhp-hr*)	Annual Hours of Operation Limit for Maintenance and Testing
• New Prime Engines	≤0.01	None
• New Emergency Standby Engines		100 (District Discretion)
• New Emergency Standby Engines	≤0.15	50
• New Agricultural Operation Engines		None
• New ≤ 50 hp	Applicable off-road standards	None

*grams per brakehorsepower-hour

Table E-2: Summary of Proposed Diesel PM Standards and Operating Limits for In-Use Engines

Engine Applications	Diesel PM Emission Limit (g/bhp-hr)	Annual Hours of Operation Limit for Maintenance and Testing
• In-Use Prime Engines	0.01 or 85% reduction from baseline levels	None
• In-Use Prime Engines (not off-road certified)	30% reduction from baseline levels **and** meet 0.01 by 2011	
• In-Use Emergency Standby Engines	>0.40	20
• In-Use Emergency Standby Engines	>0.15 and ≤ 0.40	30
• In-Use Emergency Standby engines	>0.01 and ≤0.15	50 (District Discretion)
• In-Use Emergency Standby Engines	≤0.01	100 (District Discretion)
• In-Use Emergency Standby Direct-Drive Fire Pumps	none	Hours needed to comply with NFPA 25 Standard (26-33 hours)
• In-Use ≤ 50 hp	none	none

7. Are the proposed diesel PM emission standards technologically feasible?

Yes. Based upon extensive analysis and discussions with numerous stakeholders, staff has determined that the proposed diesel PM emission standards are technologically feasible.

For engines ≤ 50 hp, the proposed diesel PM emission limit applies to engines sold after January 1, 2005, and is equal to the diesel PM emission limit defined in the Off-Road Compression Ignition Engine Standards (title 13, CCR, section 2423). Since equivalently sized off-road engines must meet these standards, ARB staff concludes that it is technologically feasible for stationary diesel-fueled engines to meet these same standards.[1]

For engines > 50 horsepower, ARB staff believes these standards are achievable for the following reasons:

- Currently, approximately 50 stationary diesel-fueled engines are operating successfully in California with diesel particulate filter control technologies. The engines controlled represent a wide range of engine types, model years (1997-2003), horsepower ratings, and applications.
- The results our stationary engine retrofit demonstration program showed successful application of diesel particulate filters, diesel oxidation catalysts, and emulsified fuels on engines ranging in age from 2 to 18 years old.
- California's Off-Road Compression Ignition Standards, which are equivalent to the Federal Non-Road Diesel Engine Emission Standards, have required newly manufactured off-road engines to meet diesel PM emission standards since 1996. Currently, all newly manufactured off-road diesel-fueled engines are meeting either Tier 1, Tier 2, or Tier 3[2] emission standards, depending on the size of the engine.
  - Newly manufactured off-road engines between 175 and 750 hp are currently required to meet a diesel PM emission standard of 0.15 g/bhp-hr.
  - Newly manufactured off-road engines greater than 750 hp are currently required to meet a diesel PM emission standard of 0.40 g/bhp-hr, but they will be required to meet a diesel PM emission standard of 0.15 g/bhp-hr by 2006.
  - Newly manufactured off-road engines less than 175 hp are held to less stringent standards, but certification data indicate that approximately 18 percent of the off-

[1] In-use emission standards for engines ≤ 50 hp are not being proposed at this time. ARB staff believe there are a limited number of ≤ 50 hp stationary diesel-fueled engines, and because they have never been subject to permitting requirements, there is very little data available. The proposed ATCM will collect data that will allow the development of a more robust inventory, and ARB staff will reassess the need for in-use requirements once that data is available.

[2] Since 1996, manufacturers of diesel engines have been subject to U.S. EPA's nonroad diesel emission regulations (40 CFR Part 89). The nonroad diesel emission standards are tiered (i.e., Tier 1, 2, 3, 4), and the date upon which each tier takes effect depends on the engine size. As of January 1, 2000, all engine sizes were subject to Tier 1 standards. In 2006, all engines sizes will be subject to Tier 2, and in 2008, all engines sizes will be subject to Tier 3 standards. In May 2003, U.S. EPA proposed new Tier 4 emission standards, which will require most engines to meet a 0.01 g/bhp-hr emission rate in the 2011-2014 timeframe.

road certified engines emitted diesel PM at a rate less than or equal to 0.15 g/bhp-hr.

- The annual hour limitations for maintenance and testing of emergency standby engines range from less than 20 hours to 100 hours. ARB survey data and National Fire Protection Association (NFPA) standards indicate that, in most cases, 30 hours per year or less are sufficient to insure the proper operation of an engine when it is needed for emergency service.

8. How will the ATCM regulate stationary diesel-fueled engines used in agricultural operations?

The proposed ATCM affects only new agricultural engines at this time and establishes emissions performance standards for new agricultural engines similar to the requirements for new emergency standby engines. New engines meeting the 0.15 g/bhp-hr PM requirement are currently available "off-the-shelf" for all engine horsepower categories greater than 50 hp. However, since the certification standards for the engines in the 50-175 hp range are higher the 0.15 g/bhp-hr PM standard, only a subset of the engines certified in this category will be allowed in California.

At this time, for the reasons stated below, ARB staff is not proposing performance standards or operating hour restrictions for in-use agricultural engines. We are also not proposing to require that new engines in agricultural service meet the 0.01 g/bhp-hr PM standard for prime engines. Emission reductions from in-use agricultural engines have been realized, however, through the Carl Moyer Memorial Air Quality Standards Attainment Program (Carl Moyer Program). In its first three years (through fiscal year 2000/2001), the Carl Moyer Program funded the replacement of over 1,900 stationary agricultural pumps with lower emission engines. Based on local program data from the first three years provided by the districts, ARB staff estimates PM reductions from the Carl Moyer Program to be approximately 65 tons per year.[3] ARB staff will continue to work with the agricultural community to identify how best to further reduce PM and NOx emission from stationary diesel engines in agricultural service. We will be working to improve the agricultural engine inventory, identifying subset of agricultural engines that have the best potential for retrofits, and working with engine manufacturers and control equipment suppliers on a retrofit demonstration program. We anticipate that this effort will be completed January 2005, at which time we will return to the Board with a recommended approach.

Staff's proposal would require new agricultural engines to be the cleanest currently produced by engine manufacturers, but it would not require the installation of retrofit and add-on controls for new or in-use agricultural engines. At this time, it is not practical to require retrofit and add-on controls on new or in-use agricultural engines for several reasons, including:

[3] The San Joaquin Valley Unified Air Pollution Control District recently updated the inventory for agricultural irrigation pumps in the San Joaquin Valley. According to their estimates, as of May 2003, the district has provided funds under the Carl Moyer Program to replace 2,250 diesel-fueled agricultural irrigation pumps.

- Retrofit devices are not readily available for these applications. We believe it would be impractical to require individual owners to have to search out retrofit devices that may be available for his or her engine, obtain an installer, and service and maintain the retrofit device;
- The requirements for retrofits for prime engines need to be implemented via a district permit system to ensure proper design, implementation and enforcement. There is no such system in place for agricultural engines.[4]

We also believe that replacing diesel engines with electric power may be the best long term approach for reducing PM and NOx emissions from stationary agricultural engines. To this end, ARB staff is initiating an effort to work with the agricultural community to determine the feasibility and cost effectiveness of replacing agricultural irrigation pumps with electrically driven pumps. We expect this effort to be completed in the June 2004 timeframe. In addition, ARB staff intends to follow the development of retrofit technologies applicable to agricultural engines. When technically feasible and cost-effective retrofit controls become available, we will propose amendments to the ATCM.

9. How does the ATCM address stationary engines used in Interruptible Service Contracts (ISCs) or Rolling Blackout Reduction Programs?

Investor-owned utilities are authorized to offer optional "interruptible or curtailable" electric service to customers at discounted rates. In return, the customer agrees to reduce power consumption from the grid during periods when not enough power is available to meet all demand with an adequate reserve margin. In some cases, customers with ISC operate emergency standby engines to offset the reduction in electrical power from the grid, and in effect, become self-generators of electricity.

During the development of the ATCM, staff considered how the ATCM should address the continued use of emergency standby engines in interruptible programs. Some entities with existing contracts claimed that operating diesel-fueled emergency standby engines was justified because ISC contracts help prevent blackouts which could result in the widespread use of diesel-fueled emergency standby engines during rolling blackouts. Others argued against their use, raising concerns about public exposures to diesel PM and continued reliance on a power source that is orders of magnitude dirtier than a gas-fired plant in terms of pollution produced per megawatt of electricity generator.

A special type of ISC is the Rolling Blackout Reduction Program in San Diego County. Under this program, certain engines that have signed up to participate are asked to voluntarily reduce power when grid power reached critically low levels. In exchange for reducing power from the grid, the company is paid 20 cents a kilowatt for the power demand reduced.

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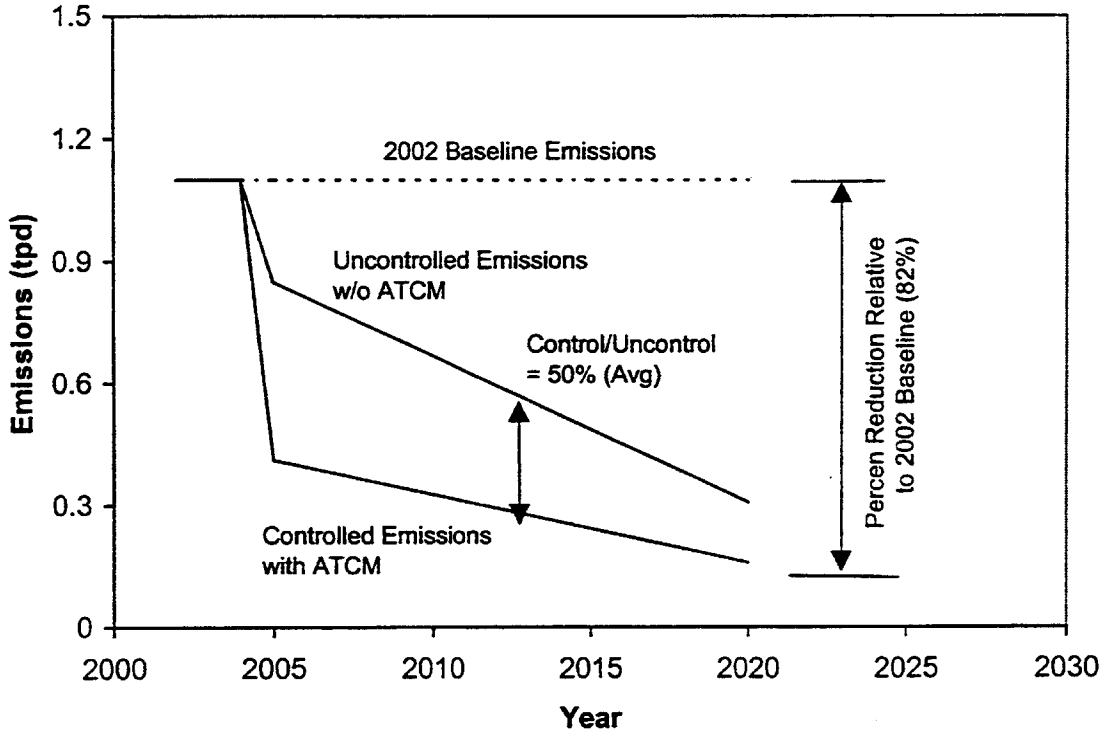
[4] H&SC Section 42310 prohibits Districts from requiring permits for equipment used in agricultural service. However, Senate Bill 700 (SB 700) considered in the 2003-2004 legislative session, would remove this prohibition. SB 700 was signed into law by Governor Davis on September 22, 2003.

While possible approaches were explored during the ATCM development, agreement on how this issue should be treated could not be reached prior to the beginning of the 45-day public comment period. ARB staff will continue to meet with interested parties on this issue and may propose an appropriate provision at the Board hearing with interested parties that would allow the continued use of some of these engines.

10. What are the environmental impacts of the proposed ATCM?

The proposed ATCM will reduce diesel PM emissions and resulting exposures from stationary engines throughout California. ARB staff estimates that, with implementation of the ATCM, diesel PM emissions from stationary diesel-fueled engines used in non-agricultural operations will be reduced by approximately 80 percent or 0.9 tons per day in 2020 relative to the 2002 baseline. These reductions are due to both the implementation of the ATCM and the expected normal turnover of engines. As shown in Figure E-1, ARB staff estimates that the ATCM will result in a 50 percent reduction in diesel PM emissions from the projected uncontrolled baseline.

Figure E-1: Projected Diesel PM Emissions with and without the ATCM



California's air quality will also experience benefits from reduced criteria pollutant emissions (e.g., NOx, ROG). ARB staff estimates that, as older engines are replaced with new engines or retrofitted with diesel PM control devices, between 2005 and 2020, approximately 2.2 tons per day NOx and 0.3 tons per day of ROG will be removed from California's air. We anticipate significant health cost savings due to reduced mortality, incidences of cancer, PM related cardiovascular effects, chronic bronchitis, asthma, and

hospital admissions for pneumonia and asthma-related conditions. These directly emitted diesel PM reductions are expected to reduce the number of premature deaths in California. ARB staff estimates that 121 premature deaths (60-185, 95 percent confidence interval (95 CI)) will be avoided by 2020. Prior to 2020, cumulatively, it is estimated that 60 premature deaths (29-90, 95 CI) would be avoided by 2010 and 97 (48-146, 95 CI) by 2015. ARB staff has concluded that no significant adverse environmental impacts should occur under the proposed ATCM.

11. What are the economic impacts of the proposed ATCM?

ARB staff estimates the cost of the ATCM to affected businesses and government agencies to be approximately 47 million dollars for the total capital costs. This corresponds to 8.4 million dollars annually over the useful life of the control equipment. The useful life of the control equipment depends on the number of hours the engine is expected to operate annually. For prime engines, the useful life ranges from 4 to 25 years with a 10-year average. For emergency standby engines, the expected useful life is 25 years.

The majority of the costs will be borne by prime engine owners. In many cases, owners of emergency standby engines will have no cost or net savings due to the reduced operating hours. We estimate that only a small number of emergency standby engines will need to install diesel emission controls (DECS).

Most businesses in California do not own any diesel-fueled stationary engines. For those businesses that do have engines, the cost will vary depending on the number of engines operated and the engine size, activity and operating parameters. ARB staff estimated the costs to comply with the ATCM for a typical business with a 590 horsepower prime engine. The estimated capital cost is $22,400 for the installation of a DPF. For those engines installing a DOC and then later replacing that engine with a new Tier IV engine in 2011, the estimated capital cost is $60,800. For engines with a DPF, there will be an additional annual cost of approximately $550 for maintenance.

For businesses with emergency standby engines, we expect most operators to reduce their annual hours of operation to avoid installation of DECS, which should result in cost savings due to a reduction in the annual diesel fuel usage. For example, an operator with one engine (520 hp) could reduce maintenance and testing usage from 35 to 20 hours, thereby saving about $760 annually. While most operators will likely reduce their hours of operation to meet the ATCM requirements, we estimate that about one percent of operators will need to install a DOC.

Overall, most affected businesses will be able to absorb the costs of the proposed regulation with no significant adverse impacts on their profitability. This finding is based on the staff's analysis of the estimated change in "return on owner's equity" (ROE). The analysis found that the overall change in ROE ranges from negligible to a decline of about six percent. Generally, a decline of more than ten percent in ROE suggests a significant impact on profitability. Because the proposed ATCM would not alter

significantly the profitability of most businesses, we do not expect a noticeable change in employment, business creation, elimination, or expansion, and business competitiveness in California. We also found no significant adverse economic impacts on any local or State agencies.

We estimate the overall cost effectiveness of the proposed ATCM to be about $15 per pound ($/lb) of diesel PM reduced, considering only the benefits of reducing diesel PM. Because the proposed ATCM will also reduce reactive organic gases (ROG) and NOx emissions, we allocated half of the costs of compliance against these benefits, resulting in cost effectiveness values of $8/lb of diesel PM and $1/lb of ROG plus NOx reduced.

With regard to mortality benefits, we estimate the cost of avoiding one premature death to be about $216,000 based on attributing half of the cost of controls to reduce diesel PM. Compared to the U.S. EPA's present assignment of $4.4 million as the value of an avoided death, this proposed ATCM is a very cost-effective mechanism for preventing premature deaths caused by diesel PM.

12. How does the proposed ATCM fulfill the goals of the Diesel Risk Reduction Plan as they pertain to stationary engines?

In the Diesel Risk Reduction Plan, ARB staff recommended an ATCM for new engines be developed to reflect the ARB's permitting guidance document, Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines (September 2000). For in-use engines, ARB staff recommended retrofit controls be installed. The overall goal was to achieve the maximum feasible reduction in emissions taking into account cost and risk. Similar to other applications, the target was to achieve an 85 percent reduction in the emissions from stationary engines by 2020.

The proposed ATCM is consistent with the goals in the Diesel Risk Reduction Plan. The requirements and standards in the ATCM are based on the application of BACT for diesel PM. ARB staff estimates that with implementation of the ATCM diesel PM emissions will be reduced by approximately 0.9 tons per year in 2020 relative to the 2002 baseline. This represents about an 80 percent reduction from the 2002 baseline emissions. For new engines used in agricultural applications, BACT is defined as an engine with a 0.15 g/bhp-hr emission rate. Requirements for in-use agricultural engines are not included in the ATCM; however, as discussed earlier, ARB staff are pursuing several avenues to achieve further diesel PM emission reductions from this category. Our analysis of how to further reduce PM and NOx emission from stationary diesel engines in agricultural service will be completed by January 2005.

13. How does the proposed ATCM relate to ARB's goals for Environmental Justice?

Environmental Justice is defined as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and

enforcement of environmental laws, regulations, and policies. ARB's Environmental Justice Policies are intended to promote the fair treatment of all Californians and cover the full spectrum of the ARB's activities.

The proposed ATCM is consistent with the environmental justice policy to reduce health risks from TACs in all communities, including those with low-income and minority populations, regardless of location. The ATCM will reduce diesel PM emissions from stationary CI engines by requiring the use of the best available control technologies or by reducing the hours of operation. The proposed ATCM will provide air quality benefits for all communities depending upon the number of existing emergency standby and/or prime engines currently operating in those communities.

14. How does the proposed ATCM affect sensitive receptors such as children and cumulative risk?

The goal of the proposed ATCM is to establish diesel PM emission standards and operating requirements for stationary engines that are based on the implementation of the best available diesel PM control technologies (BACT) and the use of the lowest-emitting diesel-fueled CI engines. The specific requirements for a given stationary diesel-fueled engine are dependant on a number of factors including, application (prime or emergency standby), hours of operation, and emission rate of the engine. In most cases, the residual cancer risk from each engine subject to the emission standards and operating requirements of the proposed ATCM is estimated to be less than 10 excess cancer cases in a million, which is consistent with the threshold risk level used by most districts when defining significant risk levels. When estimating the cancer risk to a receptor, the risk assessment methodology estimates the risk based on a lifetime of exposure (70 years), and it accounts for the periods in life when we are most susceptible to the health effects of exposure to diesel PM – both early and late in life. To further reduce children's exposure to diesel PM, the ATCM prohibits schools from operating stationary diesel engines, except for emergencies, when school activities are taking place.

Cumulative risk in this case refers to the cancer risk posed by more than one stationary diesel-fueled engine operating at the same facility or in the same general area. The proposed ATCM will reduce cumulative risk since it will require individual engines to implement BACT. However, ARB staff recognizes that there may be specific situations where the cumulative risk from engines located in close proximity of one another may be elevated, even after the proposed ATCM is fully implemented. Since these are site-specific situations, depending on many factors, the ATCM provides the Districts the authority to establish more stringent diesel PM emission standards and operating requirements on a site-specific basis. In addition to the requirements of the proposed ATCM, the Air Toxics "Hot Spots" program will also be used to determine if there is a need to reduce the cumulative risk from more than one stationary diesel-fueled engine operating at the same facility. The "Hot Spots" program will require facilities to evaluate the cumulative risks from engines at their facility and require additional reductions in diesel PM emissions to reduce excessive risks.

15. How are the AB 2588 "Hot Spots" requirements and the ATCM interrelated?

ARB staff is currently developing amendments to the Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines Regulation to address diesel engines. These amendments are being developed to align with the ATCM requirements with the goal of avoiding duplicative requirements and ensuring that potential risks from all engines are evaluated and mitigated where necessary. As currently envisioned, ARB staff believes that the initial reporting requirement in the ATCM will also fulfill the emission inventory requirement of "Hot Spots." In some cases, compliance with the ATCM will fulfill all requirements under "Hot Spots." For example, for owners of a single emergency standby diesel engine at a facility currently not in the "Hot Spots" program, compliance with the ATCM will also reduce the potential risk from that engine to below 10 in a million. For these engines, compliance with the ATCM will also fulfill the "Hot Spots" requirements provided the district has a 10 in a million significance level.

The proposed amendments to the "Hot Spots" Emission Inventory Criteria and Guidelines Regulation are tentatively scheduled to be considered by the Board at its December 2003 hearing. ARB staff expects to conduct additional workshops this fall to further define the necessary modifications to the regulation.

16. What future activities are planned?

After Board consideration and approval of the proposed ATCM, ARB staff will work on a number of projects related to the implementation of the proposed ATCM, the collection and processing of engine-related data, and the improvement of the stationary diesel-fueled engine emission inventory. Specifically, resources will be devoted to the following:

- Working with districts to implement the requirements of the ATCM

  After adoption, each district is required to either implement and enforce the ATCM or adopt its own rule that is as effective or more effective overall. ARB staff will work with each district to ensure these requirements are being met and will develop implementation guidance as appropriate.

- Monitoring implementation

  ARB staff will monitor implementation of the proposed ATCM. This will include monitoring advancements in emission control technologies and evaluating BACT. In the event implementation reveals amendments to the ATCM are warranted or that BACT has changed, ARB staff will propose amendments for the Board's consideration.

- Monitoring the availability of retrofit devices for agricultural applications and high-use emergency standby engines

ARB staff will follow the development of retrofit technologies applicable to agricultural engines and high-use emergency standby engines. In the event technically feasible and cost-effective retrofit controls become available, we will propose amendments to the ATCM.

- Evaluating the feasibility of replacing agricultural diesel-fueled irrigation pumps with electrically driven pumps

  Significant environmental benefits could be realized from the replacement of diesel-fueled irrigation pumps with electrically driven pumps. Over the next several months, ARB staff intends to work with California's agricultural interests and other parties determine if such a transition could be a cost-effectiveness option that should be incorporated into the ATCM.

- Evaluating in-use experience with proposed test methods

  Because the proposed ATCM incorporates a new field method for stationary diesel-fueled engines, ARB staff will monitor application of the test method, work with the districts to develop appropriate in-use compliance testing protocols, and develop any necessary guidance for use of the testing results in health risk assessments.

- Integration of "Hot Spots" and the ATCM

  As stated previously, ARB staff will develop amendments to the *"Hot Spots" Emission Inventory Criteria and Guidelines Regulation* to address diesel PM with the goals of avoiding duplicative requirements and ensuring that potential risks from all engines are evaluated and mitigated as necessary. In addition, ARB staff also intends to determine if the risk assessment procedures can be streamlined by developing more simplified estimation methods that could be used in lieu of air dispersion modeling. Any simplified methodology would be incorporated into guidance for the "Hot Spots" evaluation and ARB guidance on conducting health risk assessments for stationary diesel-fueled engines.

- Updating inventory with the reporting data

  A key requirement of the ATCM is the initial reporting of information on the number of engines and their operating characteristics. This information will be used to update the ARB's emission inventory for stationary engines and will also be incorporated into the Community Health Air pollution Information System (CHAPIS), which will be made available to the public in the coming months. CHAPIS is a new web-based mapping tool that will provide maps of air pollution emission sources over the Internet.

17. What is staff's recommendation?

We recommend the Board approve the proposed ATCM presented in this report (Appendix A). The ATCM will reduce diesel PM emissions from new and in-use stationary CI engines by requiring the use of the best available control technologies or by reducing the hours of operation. The proposed ATCM will provide air quality benefits for all communities depending upon the number of existing emergency standby and/or prime engines currently operating in those communities. ARB staff believes the proposed ATCM is technologically feasible and necessary to carry out the Board's responsibilities under State law.

I. INTRODUCTION

In this chapter, the Air Resources Board (ARB or Board) staff provides an overview of the Staff Report, discusses the purpose of the ATCM, and discusses the regulatory authority the ARB has to adopt the ATCM.

A. Overview

This report presents the proposed Airborne Toxics Control Measure to reduce the emissions of diesel particulate matter (diesel PM) from stationary diesel-fueled compression ignition engines (stationary diesel-fueled engines). A detailed summary of the requirements of the proposed ATCM is found in Chapter V. The report also shares the information that ARB staff used in developing the proposed ATCM. This information includes:

- the health effects associated with exposure to diesel PM emissions (Chapter II);
- the requirements of current regulations that are designed to reduce emissions from stationary compression ignition engines (Chapter III);
- the diesel PM emission inventory and health risks posed by stationary diesel-fueled engines (Chapter IV);
- a discussion of the technical feasibility of the control technologies that can be used to comply with the emission standards defined in the proposed ATCM (Chapter VI),
- a discussion of the regulatory alternatives to the proposed ATCM and why they were not chosen (Chapter VII);
- the environmental impacts of implementing the proposed ATCM (Chapter VIII); and
- the economic impacts of the proposed ATCM (Chapter IX).

In developing the proposed ATCM, there were a number of technical and policy issues that had to be addressed. These included defining a test method for stationary diesel-fueled engines and integrating the requirements of the proposed ATCM with the AB 2588 "Hot Spots" Program. These and other key issues are discussed in Chapter X, Additional Considerations.

The text of the proposed ATCM and other supporting information are found in the Appendices.

B. Purpose

The primary purpose of the proposed ATCM is to reduce the general public's exposure to diesel PM from stationary diesel-fueled engines. The proposed ATCM establishes requirements that fall in four major categories: fuel use requirements; emission standards; operational requirements; and recordkeeping, reporting, and monitoring requirements.

The purpose of the fuel use requirements is to ensure that only the cleanest available diesel or alternative diesel fuels are used in stationary diesel-fueled engines. The

purpose of the stringent diesel PM emission standards are to ensure that the sellers and owner/operators of both new and in-use stationary diesel-fueled engines are implementing the best available diesel PM control strategies. The purpose of the operational requirements is to ensure that owners/operators of both new and in-use stationary diesel-fueled engines reduce overall emissions and concurrently operate only when essential, thereby limiting the near-source risk associated with exposure to diesel PM to the maximum extent possible. An example of an operational requirement is the limit placed on the number of hours an owner of an emergency standby engine can run an engine for maintenance and testing purposes. Finally, the purpose of the recordkeeping, reporting, and monitoring requirements is to provide both the district and the ARB staff with information on where stationary diesel-fueled engines are located, how they are used, and what strategies sellers, owners, and operators are using to comply with the requirements of the proposed ATCM. Chapter V of this Staff Report contains a plain English discussion of the key requirements of the proposed ATCM, and Appendix A contains the full text of the proposed ATCM.

C. Regulatory Authority

Several sections of the California Health and Safety Code (H&SC) provide the ARB with authority to adopt the proposed ATCM. Sections 39600 (General Powers) and 39601 (Standards, Definitions, Rules, and Measures) of the H&SC confer to the ARB the general authority and obligation to adopt rules and measures necessary to execute the Board's powers and duties imposed by State law.

More specifically, California's Air Toxics Program, established under California law by AB 1807 (Stats. 1983, Ch. 1047) and set forth in Health and Safety Code sections 39650 through 39675, mandates the identification and control of TACs in California. The identification phase of the Air Toxics Program requires the ARB, with participation of other state agencies such as the Office of Environmental Health Hazard Assessment (OEHHA), to evaluate the health impacts of and exposure to substances and to identify those substances that pose the greatest health threat as TACs. The ARB's evaluation is made available to the public and is formally reviewed by the Scientific Review Panel (SRP) established under Health and Safety Code section 39670. Following the ARB's evaluation and the SRP's review, the Board may formally identify a TAC at a public hearing. Following the identification of a substance as a TAC, Health and Safety Code sections 39658 and 39665 requires the ARB, with the participation of the air pollution control and air quality management districts, and in consultation with affected sources and interested parties, to prepare a report on the need and appropriate degree of regulation for that substance (risk management phase).

In August 1998, the Board identified diesel PM as a TAC, and in September 2000, the ARB adopted the "Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-fueled Engines and Vehicles" (Diesel Risk Reduction Plan). (ARB, 2000) The Diesel Risk Reduction Plan was the first formal product of the risk management phase and serves as the needs assessment under the AB1807 process. In the Diesel Risk Reduction Plan, the ARB indentified the available options to reduce diesel PM and the

recommended control measures to achieve reductions, including a measure to reduce diesel PM from stationary diesel-fueled engines.

In 1999, California's Air Toxics Program was amended by Senate Bill 25 (Stats. 1999, Ch. 731) to provide additional requirements for further consideration of health impacts to infants and children. As part of these requirements, the OEHHA was to identify up to five TACs as making children especially susceptible to illness. The OEHHA published the "Prioritization of Toxic Air Contaminants under the Children's Environmental Health Protection Act" in October 2001, identifying diesel PM as one of the five TACs. Additional requirements established by Senate Bill 25 in Health and Safety Code section 39669.5 directs the ARB to adopt control measures, as appropriate, to protect public health, particularly infants and children, from these specially identified TACs.

This ATCM is being proposed to fulfill the goals of the Diesel Risk Reduction Plan and to comply with the requirements of H&SC section 39666 and 39669.5 to prevent an endangerment to public health. To control criteria pollutant emissions, H&SC section 43013(b) directs the ARB to adopt standards and regulations for non-vehicle engines, which covers stationary diesel-fueled engines.

D. Public Outreach and Environmental Justice

Environmental Justice

The ARB is committed to integrating environmental justice in all of its activities. On December 13, 2001, the Board approved "Policies and Actions for Environmental Justice," which formally established a framework for incorporating Environmental Justice into the ARB's programs, consistent with the directive of California state law. (ARB, 2001) Environmental Justice is defined as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. These policies apply to all communities in California, but recognize that environmental justice issues have been raised more in the context of low-income and minority communities.

The Environmental Justice Polices are intended to promote the fair treatment of all Californians and cover the full spectrum of the ARB's activities. Underlying these Policies is a recognition that the agency needs to engage community members in a meaningful way as it carries out its activities. People should have the best possible information about the air they breathe and what is being done to reduce unhealthful air pollution in their communities. The ARB recognizes its obligation to work closely with all communities, environmental and public health organizations, industry, business owners, other agencies, and all other interested parties to successfully implement these Policies.

During the development process, the ARB staff proactively searched for opportunities to present information about the proposed ATCM at places and times convenient to stakeholders. For example, the meetings were held at times and locations that

encouraged public participation, including evening sessions. Attendees included representatives from environmental organizations, military, communication companies and service providers, engine and diesel emission control associations, and other parties interested in prime or emergency standby stationary diesel-fueled engines. These individuals participated both by providing data and reviewing draft regulations and by participating in open forum workshops, in which staff directly addressed their concerns. Table I-1 below provides meeting dates that were made to apprise the public about the development of the proposed ATCM.

The proposed ATCM is consistent with the environmental justice policy to reduce health risks from TACs in all communities, including those with low-income and minority populations, regardless of location. The ATCM will reduce diesel PM emissions from all stationary diesel-fueled engines by requiring the use of the best available control technologies or by reducing the hours of operation. The proposed ATCM will provide air quality benefits for all communities depending upon the number of existing emergency standby and/or prime engines currently operating in those communities.

Outreach Efforts

Since the identification of diesel PM as a TAC in 1998, the public has been more aware of the health risks posed by the emissions of this TAC. At many of the ARB's community outreach meetings over the past few years, the public has raised questions regarding our efforts to reduce exposure to diesel PM. At these meetings, ARB staff told the public about the Diesel Risk Reduction Plan adopted in 2000 and described some of the measures in that plan, including those for stationary diesel-fueled engines.

The ARB has held 8 public workshops and 2 community outreach meetings since 2001 in developing this rule (see Table I-1). Over 700 individuals and/or companies were notified for each workshop through a series of mailings. Notices were posted to ARB's diesel risk reduction and public workshops web sites and e-mailed to subscribers of the stationary diesel risk reduction electronic list server. For the last six workshops, live audio broadcasts were also available to the public via the Internet. For the community outreach meetings, notices were send to individuals on our Neighborhood Assessment Program mailing lists.

Table I-1: Workshop/Outreach Meeting Locations and Times

Date	Meeting	Location	Time
February, 14 2001	Public Workshop	Cal/EPA Building, Sacramento	9:30 a.m.
January, 16, 2002	Public Workshop	Cal/EPA Building, Sacramento	9:30 a.m.
April, 4 2002	Public Workshop	Cal/EPA Building, Sacramento	9:30 a.m.
September 4, 2002	Public Workshop	Cal/EPA Building, Sacramento	9:30 a.m.
November 19, 2002	Public Workshop	Cal/EPA Building, Sacramento	9:30 a.m.
March 6, 2003	Public Workshop	Cal/EPA Building, Sacramento	9:30 a.m.
April 1, 2003	Community Outreach	Hollenbeck Middle School, Boyle Heights (ATCM Overview)	6:00 p.m.
April 30, 2003	Community Outreach	Wilmington Park Elementary School, Wilmington (ATCM Overview)	6:00 p.m.
June 5, 2003	Public Workshop	Cal/EPA Building, Sacramento	9:30 a.m.
August 26, 2003	Public Workshop	Cal/EPA Building, Sacramento	9:30 a.m.

In addition to the public workshops or community outreach meetings presented in Table I-1, ARB staff and management participated in numerous industry and government agency meetings over the past three years, presenting information on the Diesel Risk Reduction Plan and our proposed regulatory approach for stationary diesel-fueled engines. Some of the industry groups and environmental associations participating were the California Council for Economic and Environmental Balance, Association of California Water Agencies, Construction Materials Association of California, American Lung Association, Engine Manufacturers Association, Manufacturers of Emission Controls Association, Southern California Alliance of Publicly Owned Treatment Works, California Ski Industry Association, National Resources Defense Counsel, Environmental Defense, the United States Navy, California Healthcare Association, California Army National Guard, University of California Office of the President, agricultural community interests, and several publicly treated wastewater facilities. Several state agencies, including the Department of General Services, California Youth Authority, Department of Water Resources, and the California Department of Corrections were contacted and invited to meet with ARB staff to discuss the propose ATCM and how it relates to their agencies. Staff also participated in bi-monthly and sometimes monthly meetings of the California Air Pollution Control Officers Association (CAPCOA) and CAPCOA Engineering Managers, where current status reports were given on the progress of the proposed regulation, and feedback from CAPCOA was incorporated into the draft ATCM.

In February and March 2001, staff held eight public consultation meetings with the agricultural community to initiate dialogue on the implementation of the Diesel Risk Reduction Plan. Members of California's Farm Bureaus, the Nisei Farmers League, and

other agricultural organizations were invited to attend. In addition, an agriculture working group was formed to provide a forum for discussing issues with the proposed ATCM unique to the agriculture industry. The working group met several times during 2002 and 2003 and provided valuable assistance in developing the ATCM as it relates to California's agricultural activities.

As a way of inviting public participation and enhancing the information flow between the ARB and interested parties, staff created a diesel risk reduction program Internet web site (http://www.arb.ca.gov/diesel/dieselrrp.htm) in December 2000. Since that time, staff has consistently made available on the web site all related documents, including meeting presentations and draft versions of the proposed regulatory language. The web site has also provided background information on diesel PM, fact sheets, workshop and meeting notices and materials, and other diesel related information, and has served as a portal to other web sites with related information.

Outreach efforts have also included hundreds of personal contacts via telephone, electronic mail, regular mail, surveys, facility visits, and individual meetings with interested parties. These contacts have included interactions with engine manufacturers and operators, emission control system manufacturers, local, national, and international trade association representatives, environmental, pollution prevention, and public health organizations, State agencies, military officials and representatives, and other federal agencies.

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II. NEED FOR CONTROL OF DIESEL PARTICULATE MATTER

In 1998, the Air Resources Board identified diesel particulate matter (diesel PM) as a TAC. Diesel PM is by far the most important TAC and contributes over 70 percent of the estimated risk from air toxics today. In September 2000, the ARB approved the "Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles" (Diesel Risk Reduction Plan). The goal of the Diesel Risk Reduction Plan is to reduce diesel PM emissions and the associated cancer risk by 85 percent in 2020. In addition, in 2001, the Office of Environmental Health Hazard Assessment identified diesel PM as one of the TACs that may cause children or infants to be more susceptible to illness pursuant to the requirements of Senate Bill 25 (Stats. 1999, ch. 731). Senate Bill 25 also requires the ARB to adopt control measures, as appropriate, to reduce the public's exposure to these special TACs (H&SC section 39669.5).

This proposed ATCM, to reduce diesel PM emissions from stationary diesel-fueled engines, is one of a large group of regulations being developed to achieve the emission reduction goals of the Diesel Risk Reduction Plan of protecting the health of Californians by reducing the public's exposure to diesel PM. The proposed ATCM will also reduce emissions of ROG and oxides of nitrogen (NOx), precursors to the formation of ozone.

This chapter describes the physical and chemical characteristics of diesel PM and discusses the health effects of the pollutants emitted by diesel engines and environmental benefits from the proposed regulation. As discussed below, it is important that steps be taken to reduce emissions from all diesel-fueled engines, including stationary diesel-fueled engines, to reduce public exposures to diesel PM and ozone, further progress in meeting the ambient air quality standards, and to improve visibility.

A. Physical and Chemical Characteristics of Diesel PM

Diesel engines emit a complex mixture of inorganic and organic compounds that exist in gaseous, liquid, and solid phases. The composition of this mixture will vary depending on engine type, operating conditions, fuel, lubricating oil, and whether or not an emission control system is present. The primary gas or vapor phase components include typical combustion gases and vapors such as carbon monoxide (CO), carbon dioxide (CO_2), sulfur dioxide (CO_2), oxides of nitrogen (NOx), reactive organic gases (ROG), water vapor, and excess air (nitrogen and oxygen). For example, an uncontrolled 1988 500hp diesel engine could have a PM emission rate of over 0.5 g/bhp-hr, whereas a 2003 model year engine is required to meet a 0.15 g/bhp-hr emission rate and, under the proposed Tier 4 standards, that same size engine will be required to meet a 0.01 g/bhp-hr emission rate in the 2011-2014 timeframe.

The emissions from diesel-fueled engines also contain potential cancer-causing substances such as arsenic, nickel, benzene, formaldehyde, and polycyclic aromatic

hydrocarbons (PAHs). There are over 40 substances that are listed by the U.S. EPA as hazardous air pollutants and by the ARB as TACs in emissions from diesel-fueled engines. Fifteen of these substances are listed by the International Agency for Research on Cancer as carcinogenic to humans, or as a probable or possible human carcinogen. The list includes the following substances: formaldehyde, acetaldehyde, 1,3-butadiene, antimony compounds, arsenic, benzene, beryllium compounds, inorganic lead, mercury compounds, bis(2-ethylhexyl)phthalate, dioxins and dibenzofurans, nickel, POM (including PAHs); and styrene.

Diesel PM is either directly emitted from diesel-powered engines (primary particulate matter) or is formed from the gaseous compounds emitted by a diesel engine (secondary particulate matter). Diesel PM consists of both solid and liquid material and can be divided into three primary constituents: the elemental carbon fraction; the soluble organic fraction, and the sulfate fraction.

Many of the diesel particles exist in the atmosphere as a carbon core with a coating of organic carbon compounds, or as sulfuric acid and ash, sulfuric acid aerosols, or sulfate particles associated with organic carbon. (Beeson, 1998) The organic fraction of the diesel particle contains compounds such as aldehydes, alkanes and alkenes, and high-molecular weight PAH and PAH-derivatives. Many of these PAHs and PAH-derivatives, especially nitro-PAHs, have been found to be potent mutagens and carcinogens. Nitro-PAH compounds can also be formed during transport through the atmosphere by reactions of adsorbed PAH with nitric acid and by gas-phase radical-initiated reactions in the presence of oxides of nitrogen. Fine particles may also be formed secondarily from gaseous precursors such as SO2, NOx, or organic compounds. Fine particles can remain in the atmosphere for days to weeks and travel through the atmosphere for hundreds to thousands of kilometers, while coarse particles deposit to the earth within minutes to hours and within tens of kilometers from the emission source.

Almost all of the diesel particle mass is in the fine particle range of 10 microns or less in diameter (PM_{10}). Approximately 94 percent of the mass of these particles are less than 2.5 microns ($PM_{2.5}$) in diameter. Diesel PM can be distinguished from noncombustion sources of $PM_{2.5}$ by the high content of elemental carbon with the adsorbed organic compounds and the high number of ultrafine particles (organic carbon and sulfate).

The soluble organic fraction (SOF) consists of unburned organic compounds in the small fraction of the fuel and atomized and evaporated lube oil that escape oxidation. These compounds condense into liquid droplets or are adsorbed onto the surfaces of the elemental carbon particles. Several components of the SOF have been identified as individual TACs.

B. Health Impacts of Exposure to Diesel PM, Ambient Particulate Matter, and Ozone

The proposed ATCM will reduce the public's exposure to diesel PM as well as reduce ambient particulate matter. In addition, the proposed ATCM is expected to result in

reductions in emissions of NOx and ROG, which are precursors to the formation of ozone in the lower atmosphere. The primary health impacts of these air pollutants are discussed below.

Diesel Particulate Matter

Diesel PM is of specific concern because it poses a lung cancer hazard for humans as well as a hazard from noncancer respiratory effects such as pulmonary inflammation. (ARB, 1998a) Because of their small size, the particles are readily respirable and can effectively reach the lowest airways of the lung along with the adsorbed compounds, many of which are known or suspected mutagens and carcinogens. (ARB, 2002) More than 30 human epidemiological studies have investigated the potential carcinogenicity of diesel PM. On average, these studies found that long-term occupational exposures to diesel exhaust were associated with a 40 percent increase in the relative risk of lung cancer. (ARB, 1998b) However, there is limited specific information that addresses the variable susceptibilities to the carcinogenicity of diesel exhaust within the general human population and vulnerable subgroups, such as infants and children and people with preexisting health conditions. The carcinogenic potential of diesel exhaust was also demonstrated in numerous genotoxic and mutagenic studies on some of the organic compounds typically detected in diesel exhaust. (ARB, 1998b)

Diesel PM was listed as a TAC by ARB in 1998 after an extensive review and evaluation of the scientific literature by OEHHA. (ARB 1998c) Using the cancer unit risk factor developed by OEHHA for the TAC program, it was estimated that for the year 2000, exposure to ambient concentrations of diesel (1.8 $\mu g/m^3$) could be associated with a health risk of 540 potential cancer cases per million people exposed over a 70-year lifetime.

Another highly significant health effect of diesel exhaust exposure is its apparent ability to act as an adjuvant in allergic responses and possibly asthma. (Dab, 2000) (Diaz-Sanchez, 1996) (Kittelson, 1999) However, additional research is needed at diesel exhaust concentrations that more closely approximate current ambient levels before the role of diesel PM exposure in the increasing allergy and asthma rates is established.

Ambient Particulate Matter

The key health effects categories associated with ambient particulate matter, of which diesel PM is a component, include premature mortality; aggravation of respiratory and cardiovascular disease (as indicated by increased hospital admissions and emergency room visits, school absences, work loss days, and restricted activity days); aggravated asthma; acute respiratory symptoms, including aggravated coughing and difficult or painful breathing, chronic bronchitis, and decreased lung function that can be experienced as shortness of breath. (U.S. EPA 2000, U.S. EPA 2003)

Health impacts from exposure to the fine particulate matter ($PM_{2.5}$) component of diesel exhaust have been calculated for California, using concentration-response equations

from several epidemiological studies. Both mortality and morbidity effects could be associated with exposure to either direct diesel $PM_{2.5}$ or indirect diesel $PM_{2.5}$, the latter of which arises from the conversion of diesel NO_x emissions to $PM_{2.5}$ nitrates. It was estimated that 2000 and 900 premature deaths resulted from long-term exposure to either 1.8 $\mu g/m^3$ of direct $PM_{2.5}$ or 0.81 $\mu g/m^3$ of indirect $PM_{2.5}$, respectively, for the year 2000. (Lloyd, 2001) The mortality estimates are likely to exclude cancer cases, but may include some premature deaths due to cancer, because the epidemiological studies did not identify the cause of death. Exposure to fine particulate matter, including diesel $PM_{2.5}$ can also be linked to a number of heart and lung diseases.

Ozone

Diesel exhaust consists of hundreds of gas-phase, particle-phase, and semi-volatile organic compounds, including typical combustion products, such as CO_2, hydrogen, oxygen, and water vapor, as well as CO, ROG, carbonyls, alkenes, aromatic hydrocarbons, PAHs, PAH derivatives, and sulfur oxides (SOx) - compounds resulting from incomplete combustion. Ozone is formed by the reaction of ROG and NOx in the atmosphere in the presence of heat and sunlight. The highest levels of ozone are produced when both ROG and NOx emissions are present in significant quantities on clear summer days. This pollutant is a powerful oxidant that can damage the respiratory tract, causing inflammation and irritation, which can result in breathing difficulties.

Studies have shown that there are impacts on public health and welfare from ozone at moderate levels that do not exceed the 1-hour ozone standard. Short-term exposure to high ambient ozone concentrations have been linked to increased hospital admissions and emergency visits for respiratory problems. (Peters, 2001) Repeated exposure to ozone can make people more susceptible to respiratory infection and lung inflammation and can aggravate preexisting respiratory diseases, such as asthma. Prolonged (six to eight hours), repeated exposure to ozone can cause inflammation of the lung, impairment of lung defense mechanisms, and possibly irreversible changes in lung structure, which over time could lead to premature aging of the lungs and/or chronic respiratory illnesses such as emphysema and chronic bronchitis.

The subgroups most susceptible to ozone health effects include individuals exercising outdoors, children and people with preexisting lung disease such as asthma, and chronic pulmonary lung disease. Children are more at risk from ozone exposure because they typically are active outside, during the summer when ozone levels are highest. Also, children are more at risk than adults from ozone exposure because their respiratory systems are still developing. Adults who are outdoors and moderately active during the summer months, such as construction workers and other outdoor workers, also are among those most at risk. These individuals, as well as people with respiratory illnesses such as asthma, especially asthmatic children, can experience reduced lung function and increased respiratory symptoms, such as chest pain and cough, when exposed to relatively low ozone levels during prolonged periods of moderate exertion.

C. Health and Environmental Benefits from the Proposed Regulation

Reducing diesel PM emissions from stationary diesel-fueled engines will have both public health and environmental benefits. The proposed ATCM will reduce localized potential cancer risks associated with stationary diesel-fueled engines that are near receptors and will contribute to the reduction of the general exposure to diesel PM that occurs on a region-wide basis due to collective emissions from diesel-fueled engines. Additional benefits associated with the proposed regulation include further progress in meeting the ambient air quality standards for PM_{10}, $PM_{2.5}$, and ozone, and enhancing visibility.

Reduced Diesel PM Emissions

The estimated reductions in diesel PM emissions and the associated benefits from reduced exposure and risk are discussed in detail in Chapter VIII.

Reduced Ambient Particulate Matter Levels

Reducing diesel PM will also help efforts to achieve the ambient air quality standards for particulate matter. Both the State of California and the U.S. EPA have established standards for the amount of PM_{10} in the ambient air. These standards define the maximum amount of PM that can be present in outdoor air. California's PM_{10} standards were first established in 1982 and updated June 20, 2002. It is more protective of human health than the corresponding national standard. Additional California and federal standards were established for $PM_{2.5}$ to further protect public health (Table II-1).

Table II-1: State and National PM Standards

California Standard		National Standard	
PM_{10}			
Annual Arithmetic Mean	20 $\mu g/m^3$	Annual Arithmetic Mean	50 $\mu g/m^3$
24-Hour Average	50 $\mu g/m^3$	24-Hour Average	150 $\mu g/m^3$
$PM_{2.5}$			
Annual Arithmetic Mean	12 $\mu g/m^3$	Annual Arithmetic Mean	15 $\mu g/m^3$
24-Hour Average	No separate State standard	24-Hour Average	65 $\mu g/m^3$

Particulate matter levels in most areas of California exceed one or more of current state PM standards. The majority of California is designated as non-attainment for the State PM_{10} standard (ARB 2002). Diesel PM emission reductions from diesel-fueled engines will help protect public health and assist in furthering progress in meeting the ambient air quality standards for both PM_{10} and $PM_{2.5}$.

The emission reductions obtained with low sulfur diesel and diesel engines equipped with aftertreatment systems will result in lower ambient particulate matter levels and

significant reductions of exposure to primary and secondary diesel PM. Lower ambient particulate matter levels and reduced exposure mean reduction of the prevalence of the diseases attributed to diesel PM, reduced incidences of hospitalizations and prevention of premature deaths.

Reduced Ambient Ozone Levels

Emissions of NOx and ROG, precursors to the formation of ozone in the lower atmosphere, will also be reduced by the proposed regulation. In California, most major urban areas and many rural areas continue to be non-attainment for the State and federal 1-hour ambient air quality standard for ozone. Controlling emissions of ozone precursors would reduce the prevalence of the types of respiratory problems associated with ozone exposure and would reduce hospital admissions and emergency visits for respiratory problems. Ozone can also have adverse health impacts at concentrations that do not exceed the 1-hour NAAQS.

Table II-2: State and National Ozone Standards

	California Standard	National Standard
1 hour	0.09 ppm (180 $\mu g/m^3$)	0.12 ppm (235 $\mu g/m^3$)
8 hour	-	0.08 ppm (157 $\mu g/m^3$)

Improved Visibility

In addition to the public health effects of fine particulate pollution, inhalable particulates including sulfates, nitrates, organics, soot, and soil dust contribute to regional haze that impairs visibility.

In 1999, the U.S. EPA promulgated a regional haze regulation that calls for states to establish goals and emission reduction strategies for improving visibility in 156 mandatory Class I national parks and wilderness. California has 29 of these national parks and wilderness areas, including Yosemite, Redwood, and Joshua Tree National Parks. Reducing diesel PM from stationary diesel-fueled engines will help improve visibility in these Class I areas.

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III. STATIONARY COMPRESSION-IGNITION ENGINES: DEFINITIONS, USES, AND CURRENT REGULATIONS

A. Definitions and Uses

A compression-ignition engine is defined as any internal combustion, diesel-cycle engine. It is generally assumed that the engine will be using diesel fuel. However, compression ignition engines can also use alternative fuels (e.g., jet fuel, biodiesel, CNG, and diesel/water mixtures).

Stationary engines are generally those that remain in one location at a facility for 12 months or longer. The engines can be divided into two categories: emergency standby engines and prime engines, both of which are used in agricultural and non-agricultural applications.

Emergency Standby Engines: The most common use of an emergency standby engine is in conjunction with a generator set to provide back-up electrical power during emergencies or unscheduled power outages. Emergency generator engines can range from less than 50 horsepower to over 6,000 horsepower, depending on the end users' needs. Emergency standby engines are also used with fire pumps as part of fire suppression systems. Engines used in fire pump applications are seldom larger than 200 horsepower. Since emergency standby engines are used primarily for emergency situations, their use is generally limited and most hours of operation occur for the purposes of maintenance and testing to ensure the engines are operable when needed in an emergency. Most air districts in California limit the number of hours that an emergency standby engine can be used for non-emergency purposes to between 50 and 200 hours per year. Emergency standby engines represent the majority of all stationary engines (approximately 75 percent). There are over 19,000 diesel-fueled emergency standby engines in use in California. The engines are owned and operated by various facilities and businesses, including, but not limited to, hospitals, hotels, banks, office buildings, correctional facilities, airports, retail shopping centers, factories, military installations, schools, waste and water treatment facilities, and many other types of public agencies. The vast majority of emergency standby engines are diesel-fueled. Diesel engines provide reliable service, are easy to maintain, can easily have dedicated fuel supplies, and are required where failure of an emergency power supply is critical to human life and safety.

Prime Engines: Prime engines are used in a wide variety of applications, including compressors, cranes, generators, pumps (including agricultural irrigation pumps), and grinders/screening units. The engines are owned and operated by various facilities and businesses including recycling plants, ports, waste and recycling facilities, military installations, electrical generating companies in remote areas that are removed from the grid, and some public agencies. The size and operation of prime engines are highly variable, depending on the specific application. Prime engines can range in size from about 50 horsepower for an engine used with a screening plant used to sort wood waste, to 2,000 horsepower or more for an engine generator set that is the main source

of power for a facility. Annual operation can be as low as 100 hours a year for a prime engine driving a compressor to several thousand hours a year for an irrigation pump. There are approximately 1,300 diesel-fueled prime engines currently in use in California in non-agricultural applications.

Agricultural stationary engines are also categorized as prime engines and are used for growing and harvesting crops or raising fowl or animals for the primary purpose of making a profit, providing a livelihood, or conducting agricultural research or instruction by an educational institution. Agricultural operations do not include activities involving the processing or distribution of crops or fowl. There are approximately 5,000 stationary agricultural irrigation pump engines in California. Of the prime engines operating throughout the State, about 80 percent are agricultural irrigation pump engines.

B. Summary of Existing Regulations and Programs

This section discusses the air pollution control laws that apply to stationary diesel-fueled engines. Health and Safety Code Division 26, Section 40000 specifies that the ARB has direct responsibility for controlling emissions from motor vehicles, and that districts have the responsibility of controlling air pollution from all sources other than motor vehicles.

New Source Review Rules

A new or modified stationary diesel-fueled engine may be subject to one or more federal, State or local air pollution control laws. The federal Clean Air Act established two distinct preconstruction permit programs (termed New Source Review (NSR)) governing the construction of major new and modifying stationary sources. NSR is intended to ensure these sources do not prevent the attainment or interfere with the maintenance of the ambient air quality standards. Sources constructing in nonattainment areas are required to apply the Lowest Achievable Emission Rate (LAER) control technology to minimize emissions and to "offset" the remaining emissions with reductions from other sources. Sources constructing in attainment or unclassified areas are required by the Prevention of Significant Deterioration (PSD) program to apply the Best Available Control Technology (BACT) and meet additional requirements aimed at maintaining the region's clean air. In addition, the Federal Clean Air Act requires all major sources subject to federal NSR to obtain federal Title V operating permits governing continuing operations.

The Health and Safety Code requires districts with nonattainment areas for CO, NOx, ozone, and SOx to design permit programs for new and modified stationary sources with the potential to emit above specified levels to achieve no net increase in emissions. In these areas, districts must also require BACT on new and modified stationary sources above specified emission levels.

The Health and Safety Code allows local districts to establish a permit system that requires any person who builds, erects, alters, replaces or operates equipment or

machinery which may cause the issuance of air contaminants to obtain a permit from the district. All districts in California have adopted permit programs. Generally, the local districts incorporate the State and federal permitting requirements into their preconstruction and operating permit programs. Some districts issue separate federal permits. Most of the emission control requirements that have been established for diesel-fueled engines have been set through the district permitting programs. In addition, for particulate matter, nothing restricts the authority of a district to adopt regulations to control suspended particulate matter or visibility reducing particles.

IC Engine Regulations

While most districts require some level of control to reduce NOx emissions from new and modified stationary and portable diesel-fueled engines, only 12 districts have adopted source-specific regulations affecting emissions from existing stationary and portable diesel-fueled engines. Engines used in agricultural operations, emergency standby applications, and low capacity engines are typically exempt from these regulations. All 12 regulations set NOx and carbon monoxide (CO) standards (three districts also have hydrocarbon (HC) standards). These regulations do not set standards for diesel PM emissions. However, South Coast Air Quality Management District (SCAQMD) Regulation 1110.2 is projected by SCAQMD staff to result in a number of diesel-fueled engines being taken out of service because of the cost of satisfying the regulation's NOx standard. Consequently, SCAQMD staff expects overall diesel PM emissions will be lower in the SCAQMD by the end of 2004.

Emergency Standby Requirements

In addition to local district regulation of emergency standby engines, there are other laws and regulations that affect the use of these engines. Certain types of facilities are required by either California law or local regulations to provide for emergency lighting and power. Examples of affected facilities include medical facilities, prisons, and certain office complexes. For medical facilities, State law requires that the equipment providing the emergency lighting and power must be tested at load for 30 minutes every 7 to 10 days.[5]

Toxic New Source Review

Currently, at least eight districts have adopted Toxic New Source Review rules, and many more districts have policies. A rule is a set of criteria that has been formally adopted. A policy is a set of guiding principles that has not been codified into a rule. These rules or policies were generally not specifically designed for permitting diesel-fueled engines. Most of these rules and policies use an approach that incorporates risk levels that trigger the installation of Toxic Best Available Control Technology (T-BACT) and permit denial.

[5] An Assembly Bill (AB 390) was considered by the State Legislature in the 2003/2004 session and was enrolled on August 28, 2003. If enacted, it would reduce the required testing frequency for emergency standby diesel-fueled generators operated by health facilities.

Diesel Risk Management Guidance

The *Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines, September 2000,* (Guidance) provides assistance to local air pollution control districts and air quality management districts (districts) in making risk management decisions associated with the permitting of new stationary diesel-fueled engines that are greater than 50 horsepower. The Guidance, approved by the Board in September 2000, identifies minimum technology requirements and performance standards for reducing particulate matter emissions from new stationary diesel-fueled engines. It identifies engine categories that may be approved without a site-specific health risk assessment (HRA), provided either the minimum technology requirements or performance standards are met. The Guidance also discusses diesel-specific adjustments that may be used when a site-specific HRA is required. (ARB, 2000a) (ARB, 2002)

The key recommendations in the Guidance are:

- Approve permits for diesel-fueled engines if they meet the appropriate performance standards or minimum technology requirements (see Table III-1). Meeting the appropriate minimum technology requirements or performance standards will result in the application of the best available control technologies (BACT) and the lowest achievable risk levels, in consideration of costs, uncertainty in the emissions and exposure estimates, and uncertainties in the approved health values. For these engines, a site-specific HRA is not required.

- Emergency standby engines are not required to meet add-on control or very-low sulfur fuel requirements until the stationary compression ignition ATCM is approved.

- Require a site-specific HRA prior to approval for prime diesel-fueled engines that operate over 400 hours per year (see Table III-1). If the HRA estimates a potential cancer risk greater than or equal to of 10 chances in a million, we suggest the district review additional site-specific information; e.g., site specific design considerations, location of sensitive receptors, and alternative technologies or fuels; before making a permitting decision. This information should be summarized in a Specific Findings (SF) Report. We further recommend the public be provided the opportunity to review and comment on the proposed permit action. The APCO would consider the public's comments in making the final permitting decision.

- Conduct risk assessments consistent with the *California Air Pollution Control Officers Association (CAPCOA), Air Toxics "Hot Spots" Program, Revised 1992 Risk Assessment Guidelines* (Risk Assessment Guidelines), dated October 1993[6], and the risk assessment guidance presented in the Guidance. Use diesel PM as a surrogate for all TAC emissions from diesel-fueled engines when determining the

[6] The Office of Environmental Health Hazard Assessment (OEHHA) has just completed new risk assessment guidelines and anticipates adoption in 2003.

potential cancer risk and the noncancer chronic hazard index for the inhalation pathway.

- Estimate risk using the Scientific Review Panel's (SRP) recommended unit risk factor of 300 excess cancers per million per microgram per cubic meter of diesel PM [$3 \times 10^{-4}(\mu g/m^3)^{-1}$] based on 70 years of exposure.

- Consider the overall benefit for the project and the uncertainty in the risk assessment information when making risk management decisions.

Table III-1: Recommended Permitting Requirements for New Stationary Diesel-Fueled Engines

Engine Category	Annual Hours of Operation	Group	Performance Standard[1] (g/bhp-hr)	Minimum Technology Requirements			Additional Requirements	
				New Engine PM Emission Levels[1] (g/bhp-hr)	Fuel Technology Requirements	Add-On Control	HRA Required	SF Report
Emergency/ Standby > 50 hp[2]	≤ 100 hours[3]	1	0.15[4]	0.15[4]	CARB Diesel or equivalent	No	No	No
All Other Engines > 50 hp	≤ 400 hours	1	0.02	0.15[4]	Very low-sulfur CARB Diesel or equivalent[5]	Catalyst-based DPF or equivalent	No	No
	> 400 hours	2	0.02	0.15[4]	Very low-sulfur CARB Diesel or equivalent[5]	Catalyst-based DPF or equivalent	Yes	If HRA shows risk > 10/million

HRA - Health Risk Assessment; SF - Specific Findings; DPF - Diesel Particulate Filter

1. *California Exhaust Emission Standards and Test Procedures for New 1996 and Later Off-Road Compression–Ignition Engines*, May 12, 1993, incorporating as referenced, ISO/DP 8178 Test Procedure, Part 1, June 3, 1992, Part 4, June 30, 1992, and Part 5, June 3, 1992.
2. The emergency standby engine category is valid until March 2002, or until the analysis supporting the Emergency Standby Retrofit ATCM is complete, whichever is sooner. At that time, emergency standby engines will be required to meet the *All Other Engine >50 hp* requirements. New emergency standby engines must be "plumbed" to facilitate the installation of a catalyst-based DPF at a later date.
3. The annual hours of operation for emergency standby engines include the hours of operation for maintenance and testing runs only.
4. Includes an update and clarification made to the Guidance in a letter to the Districts on March 29, 2002. (Venturini, 2002)
5. Very low sulfur (≤ 15 ppmw) CARB diesel or equivalent is only required in areas where the district determines it is available in sufficient quantities and economically feasible to purchase. CARB diesel is required to be used in all other areas.

Distributed Generation

Distributed generation (DG) refers to the electrical generation near the place of use. DG units can generate electricity using a variety of technologies- solar (photovoltaics); wind; fuel cells; diesel, natural gas, and gasoline fueled engines; and microturbines. A DG unit is usually sized to meet the power needs of the business or residence at which it is located. Because some DG units are relatively small, some of California's 35 air pollution control districts (districts) do not require that an air quality permit be obtained for this type of equipment.

Senate Bill 1298 (SB 1298), which was chaptered in September 2000, required the ARB to adopt emission standards and establish a certification program for distributed generation technologies that are exempt from air pollution control or air quality management district permit requirements. The ARB also developed guidance to the air districts on the permitting or certification of electrical generation technologies that are subject to district permit.

The following paragraphs summarize the requirements of both the certification regulation and the guidance.

DG Certification Regulation Requirements

- Distributed generation sources must be certified by the ARB before they can be sold in California *if they are exempt from district permit requirements.*
- The DG Certification emission standards for 2003 and 2007 are summarized in Tables III-2 and III-3 below.

Table III-2: Distributed Generation January 1, 2003 Emission Standards

Pollutant	DG Unit not Integrated with Combined Heat and Power	DG Unit Integrated with Combined Heat and Power
NOx	0.5 lb/MW-hr (0.17 g/bhp-hr)	0.7 lb/MW-hr (0.24 g/bhp-hr)
CO	6.0 lb/MW-hr (2.0 g/bhp-hr)	6.0 lb/MW-hr (2.0 g/bhp-hr)
VOCs	1.0 lb/MW-hr (.34 g/bhp-hr)	1.0 lb/MW-hr (0.34 g/bhp-hr)
PM	An emission limit corresponding to natural gas with fuel sulfur content no more than 1 grain/100scf	An emission limit corresponding to natural gas with fuel sulfur content no more than 1 grain/100scf

Table III-3: Distributed Generation January 1, 2007 Emission Standards

Pollutant	All DG Units
NOx	0.07 lb/MW-hr (.02 g/bhp-hr)
CO	0.10 lb/MW-hr (.03 g/bhp-hr)
VOCs	0.02 lb/MW-hr (.007 g/bhp-hr)
PM	An emission limit corresponding to natural gas with fuel sulfur content no more than 1 grain/100scf

The above standards are not currently achievable by diesel-fueled compression ignition engine technology. They are achievable by natural gas fired microturbine and fuel cell technology.

DG Guidance Document

The ARB developed guidance for electrical generation technologies *that are subject* to district permits. These technologies included reciprocating engines. The purpose of the guidance is to assist the air districts in making permitting decisions for electrical generation technologies that are subject to district permits. The guidance includes recommended Best Available Control Technology (BACT) levels and suggested permit conditions

The Table below summarizes the BACT recommendations for Reciprocating Engines used in Distributed Generation Applications.

Table III-4: Summary of BACT for the Control of Emissions from Reciprocating Engines Used in Electrical Generation

Equipment Category	NOx lb/MW-hr	VOC lb/MW-hr	CO lb/MW-hr	PM lb/MW-hr
Fossil fuel fired	0.5 (0.15 g/bhp-hr or 9 ppmvd*)	0.5 (0.15 g/bhp-hr or 25 ppmvd*)	1.9 (0.6 g/bhp-hr or 56 ppmvd*)	0.06 (0.02 g/bhp-hr)

* lb/MW-hr standard is equivalent to g/bhp-hr and ppmdv expressed at 15 percent O_2. Concentration (ppmdv) values are approximate.

AB 2588 "Hot Spots" Information and Assessment Act

The Air Toxics "Hot Spots" Information and Assessment Act (Assembly Bill (AB) 2588) was enacted in September 1987 (Health and Safety Code 44300-44394). AB 2588 requires inventories of certain substances that facilities routinely release into the air. Emissions of interest are those that result from the routine operation of a facility or that are predictable, including but not limited to continuous and intermittent releases and process upsets or leaks.

The goals of the Air Toxics "Hot Spots" Act are to collect emissions data, to identify facilities having localized impacts, to ascertain health risks, and to notify nearby residents of significant risks. In September 1992, the "Hot Spots" Act was amended by Senate Bill (SB) 1731 to address the reduction of significant risks. The bill requires owners of significant-risk facilities to reduce their risks below the level of significance.

Since the amendment of the statute in 1992 by enactment of SB 1731, facilities that pose a potentially significant health risks to the public are required to reduce their risks, thereby reducing the near-source exposure of Californians to toxic air pollutants. Owners of facilities found to pose significant risks by a district must prepare and implement risk reduction audit and plans within six months of the determination.

AB 2588 requires the ARB to compile and maintain a list of substances posing chronic or acute health threats when present in the air. The Air Toxics "Hot Spots" Act currently identifies by reference over 600 substances which are required to be subject to the program. The ARB may remove substances from the list if criteria outlined in the law are met. A facility is subject to AB 2588 if it: 1) manufactures, formulates, uses, or releases a substance subject to the Act (or substance which reacts to form such a substance) and emits 10 tons or more per year of total organic gases, particulate matter, nitrogen oxides or sulfur oxides; 2) is listed in any district's existing toxics use or toxics air emission survey, inventory or report released or compiled by a district; or 3) manufactures, formulates, uses, or releases a substance subject to the Act (or substance which reacts to form such a substance) and emits less than 10 tons per year of criteria pollutants and is subject to emission inventory requirements.

Guidance documents are currently available for conducting emission inventories, facility prioritizations, risk assessments, and public notifications. ARB developed the *Emission Inventory Criteria And Guidelines* for conducting emission inventories, while CAPCOA developed the *Facility Prioritization Guidelines*, *Risk Assessment Guidelines*, and the *Public Notification Guidelines*. In August 1998, the ARB approved the listing of diesel PM as a TAC and the SRP conclusion that a value of 3×10^{-4} $(ug/m^3)^{-1}$ is a reasonable estimate of unit risk from diesel-fueled engines. Now that a unit risk factor has been approved, districts are required to reevaluate the classification of facilities subject to the "Hot Spots" program, specified in Health & Safety Code section 44320, operating stationary diesel-fueled engines.

Currently, diesel-fueled engines or facilities with multiple diesel-fueled engines must meet AB 2588 requirements if they use 3,000 or more gallons per year of diesel fuel, but are exempt from AB 2588 if they use less than 3,000 gallons per year. As discussed in Chapter X of this report, ARB staff is currently developing amendments to the "Hot Spots" Emission Inventory Criteria and Guidelines regulation to address all diesel-fueled engines.

Carl Moyer Program

The Carl Moyer Memorial Air Quality Standards Program (Carl Moyer Program) is a grant program that funds the incremental cost of cleaner-than-required engines and equipment. Public or private entities that operate eligible engines and/or equipment in California can participate by applying directly to their local air pollution control or air quality management districts (districts). Examples of eligible engines and equipment include heavy-duty on-road and off-road, marine, locomotive, stationary agricultural pumps, forklifts, airport ground support equipment, and heavy-duty auxiliary power units.

The Carl Moyer Program provides funds for significant near-term reductions in emissions of oxides of nitrogen (NOx), a smog-forming pollutant, and PM emissions. These reductions are necessary for California to meet its clean air commitments under the State Implementation Plan (SIP) and for air districts to meet commitments in their conformity plans, thus preventing the loss of federal highway funds for local areas throughout California. In 2000, the Carl Moyer Program guidelines were revised to set a statewide program goal to achieve a 25 percent emission reduction for PM for the third and future year program. Local air districts such as South Coast Air Quality Management District and San Joaquin Valley Unified Air Pollution Control District, which are in serious non-attainment for the federal PM standard, are required to meet a 25 percent PM emission reduction for the local program.

In its first three years (through fiscal year 2000/2001), the Carl Moyer Program has funded the replacement of over 1,900 stationary agricultural pumps, which constituted 28 percent of the total program funding. Based on local program data from the first three years provided by the districts, ARB estimates total PM reductions from the Carl Moyer Program to be approximately 65 tons per year. (ARB, 2002)

Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP) is a federally-funded incentive program administered by the United States Department of Agriculture (USDA). The EQIP regulatory language was chaptered in 1998. The EQIP program is a voluntary conservation program that promotes environmental quality and provides technical and financial assistance to agricultural producers to assist them in meeting local, state, and federal regulations.

Recently, EQIP funding has been directed towards the agricultural community's efforts to reduce air emissions. Those efforts include replacing older, dirty agricultural engines with newer, cleaner models, oiling roads, and chipping orchard waste instead of burning it. On May 1, 2003, Agricultural Secretary Ann M. Veneman announced that California would be allocated approximately $38 million for the EQIP program. Of those monies, approximately $3.5 million has been set aside to fund the replacement of approximately 300 stationary agricultural irrigation engines throughout California. The Assistant State Conservationist (programs), with the United States Department of Agriculture's Natural

Resources Conservation Service (NRCS), informed ARB staff that, in addition to the $3.5 million set aside to finance the replacement of agricultural irrigation engines, another $2 million has been allocated to fund additional air quality abatement methods, including oiling roads and chipping orchard waste. It was also reported that the NRCS would be recommending that $15 million be allocated for the EQIP Program next year. (Flach, 2003)

The EQIP funds can be used to replace existing stationary diesel-fueled agricultural engines with engines certified to the Tier II lower emission standards for nonroad engines, replace older diesel-fueled agricultural pump engines with pump motors powered by electricity, or install electric agricultural pump motors on new wells. The USDA will provide up to fifty percent of the cost to replace older, higher emitting stationary diesel engines.

Engines eligible for replacement are those in counties whose air has been classified as either severe or extreme non-attainment for ozone as defined by the federal Clean Air Act. This includes all, or a portion of, the following counties in California: El Dorado (except the Lake Tahoe Basin), Fresno, western Kern, Kings, Los Angeles, Madera, Merced, Orange, Placer (except the Lake Tahoe Basin), Riverside, Sacramento, northern and western San Bernardino, San Joaquin, eastern Solano, Stanislaus, southern Sutter, Tulare, and Ventura.

ARB staff worked with the USDA and U.S. Environmental Protection Agency staff to ensure that emission benefits associated with the EQIP were real, surplus, and quantifiable. In addition, ARB staff continues to work with the staff of the San Joaquin Valley Unified Air Pollution Control District to help implement the program.

C. Surveys for Emergency Standby and Prime Stationary Diesel-Fueled Engines

Emergency Standby Stationary Diesel-Fueled Engine Survey

In September 2002, ARB staff conducted an emergency standby diesel-fueled engine survey (ES Survey), using contact data acquired from local air pollution control and air quality management district (District) operating permits and the California Energy Commission's *Database of Public Back-Up Generators.* (CEC, 2001) Among other things, the intent of the Survey was to obtain a representative sampling of the average number of hours that emergency standby diesel-fueled engines were operated in California.

The Survey was distributed to private companies and facilities, as well as public entities, including county, city, state, and federal agencies throughout California. The ES Survey asked owners/operators to provide for each of their emergency standby diesel-fueled engines over 50 hp, the permit number (if the engine were permitted with the District), engine make, model, horsepower, model year or approximate age, and actual hours of

operation for the calendar years 1999 through 2001. The hours of operation were broken down into the following three categories:

- Maintenance and testing
- Interruptable Service Contracts [7]
- Emergencies

Of the approximately 3,000 surveys distributed, over 800 were returned with data for approximately 3,200 engines. Responding facilities were sorted into categories, which included parks, banks, nuclear power plants, hotels/motels, agriculture (food growing and production facilities, wineries, and meat processing plants), police/fire, film/TV/radio, oil/fuel/refineries, correctional, schools, waste/sanitation, other power agencies, other government agencies, hospitals, water and publicly owned treatment works (POTWs), military, telecommunications, and other private business.

The "other private business" category included, but was not limited to, building property management companies (i.e., office buildings) and retail stores. Of the total responses, 50 percent were from private companies/facilities, 42.5 percent were from public agencies (county, city, state, and federal), and 7.5 percent were undetermined.

Hours of operation data was collected for 3,038 engines. The ES Survey engines operated, on average, about 31 hours per year. However, 77 percent of those hours were for maintenance and testing, with an average of 22 hours per year. Additionally, 95 percent of all engines operated less than 50 hours per year for maintenance and testing, while 85 percent operated less than 30 hours per year. Of the facility types determined for this survey, only four had average maintenance and testing operation that exceeded 30 hours per year: schools (63.71 hours),[8] nuclear power plants (42.49 hours), hospitals (35.42 hours), and correctional facilities (30.64 hours). The four facility types combined comprised approximately 15 percent of the survey engines.

The average annual hours of operation for each activity are reported in Table III-5 below. Additional data can be found in Appendix B.

[7] Interruptable Service Contracts, also known as Interruptable Loan Contracts/Programs, are contractual agreements between the engine owners/operators and electric supply companies to provide load reduction during periods of fuel or energy shortage in return for economic compensation or benefit.
[8] The hours may not be representative due to the low number of school responding (3 percent of the total number of responses).

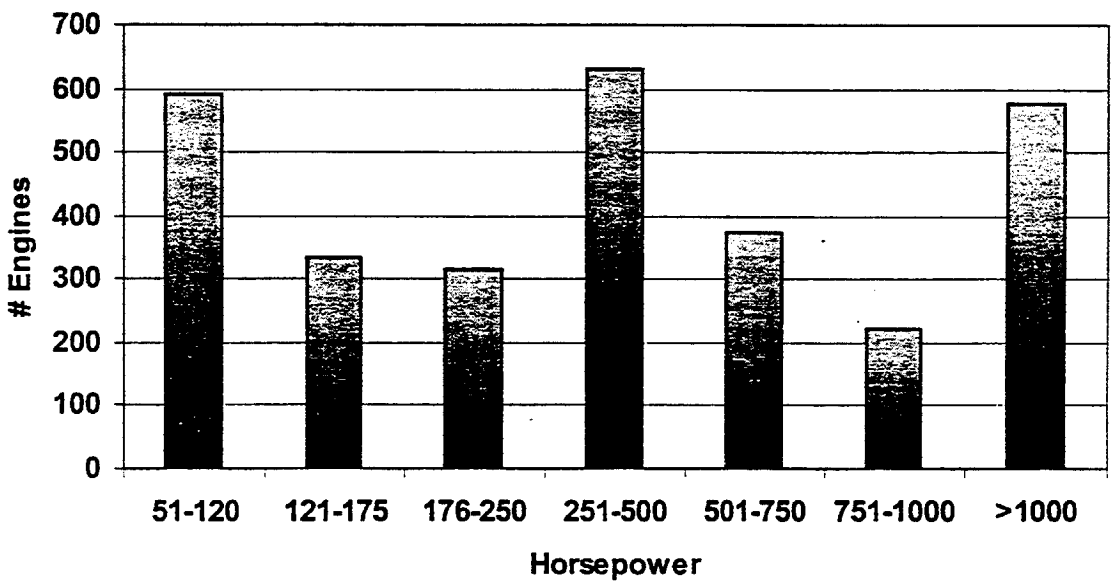
Table III-5: Average Annual Hours of Operation for Emergency Standby Engines

Activity	Year		
	1999	2000	2001
Maintenance and Testing	22	22	21
Interruptable Service Contract	1	3	4
Emergency	6	6	8
Total	29	31	33
Average Total Annual Hours of Operation	**31**		

The primary engine manufacturers reported in the ES Survey were Caterpillar, Cummins, and Detroit Diesel, which combined, comprised 72 percent of all survey engines. Other manufacturers included, but were not limited to John Deere, Ford, Generac, Isuzu, Onan, Perkins, Allis-Chalmers.

Survey engines ranged in horsepower from less than 50 to over 6,000. As shown in Figure 1, the largest numbers of engines were in the 251 to 500, 51 to 120, and greater than 1,000 horsepower ranges, respectively. The average engine horsepower was 604.

Figure III-1: Emergency Standby Engine Survey - Horsepower Distribution



Age or model year data was collected for 2,612 engines. Ages varied greatly, from new (model year 2002 or newer) to 57 years old. However, only 3 percent were more than 30 years old, and the largest number of engines (37 percent) were model years 1988 to 1995. Approximately 31 percent of the engines were model year 1996 or newer.

Only 236 engines, about 8 percent, reported hours of operation for ISC programs. Of those engines, the average annual operation for ISC purposes was approximately 26 hours. The average number of ISC hours increased during the three-year period (1999 through 2001), with a 245 percent increase from 1999 to 2000 and a 43 percent increase from 2000 to 2001. However, not all engines had increases in ISC hours. From 1999 to 2000, 56 percent of the engines experienced an increase and 62 percent showed an increase from 2000 to 2001.

Prime Stationary Diesel-Fueled Engine Survey

In March 2003, the Air Resources Board (ARB or Board) conducted the Stationary Diesel-Fueled Prime Engine Survey (Prime Survey) using contact data from District operating permits. The intent of the Prime Survey was to obtain a representative sampling of how prime stationary diesel-fueled engines are operated in California and the applications for which they are used. The information gathered would enable us to determine how many engines would potentially be affected by the proposed ATCM for stationary compression-ignition engines and would also, in combination with the ES Survey, aid in enhancing our statewide inventory of stationary diesel-fueled engines.

Like the ES Survey, the Prime Survey was distributed to private companies and facilities and public entities, including county, city, state, and federal agencies throughout California (approximately 560 in all). Respondents were asked to provide for each of their prime compression-ignition engines, the manufacturer, model, serial number, model year, rated horsepower, emission control equipment, fuel type and usage rate, application, typical load, average total hours operated per year, and normal operating hours (daily, weekly, etc.). Not all of the data fields were analyzed given the limited number of engines for which data was received.

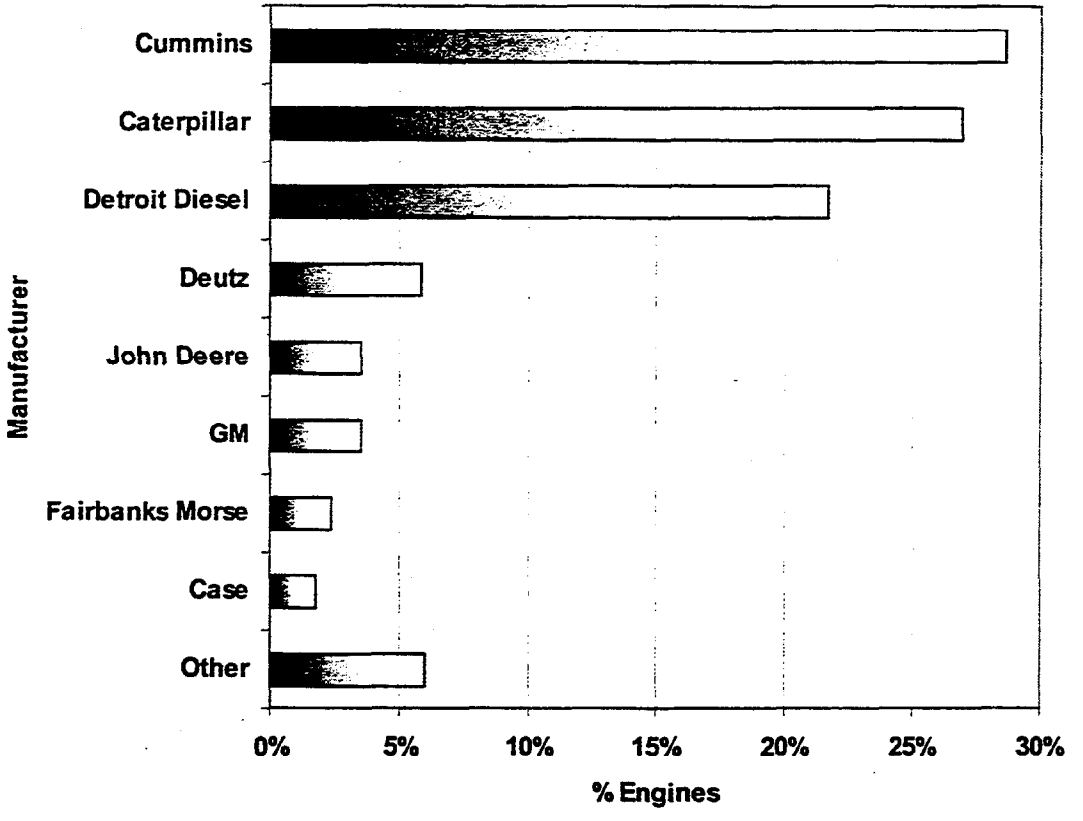
As of this writing, 59 Prime Surveys were returned with data for 171 diesel-fueled engines. Several additional surveys were returned for engines that use natural gas as a fuel, and those were not included in our analysis. Responding facilities were sorted into categories, which included military, oil/fuel/refineries, power generating and distributing facilities, waste and recycling centers, rock/sand/gravel plants, manufacturing facilities, airlines, resorts, POTWs, agricultural facilities (food growing and production companies, wineries, and meat processing plants), construction companies, miscellaneous government agencies, and other private businesses.

The "other private businesses" included auto wrecking facilities, shipping container facilities, and other miscellaneous business types. Of the total responses, 63 percent were from private companies/facilities and 37 percent were from public agencies (county, city, state, and federal).

The most prominent engine manufacturers from the Prime Survey were Caterpillar, Cummins, and Detroit Diesel, totaling 77 percent of the engines (see Figure III-2). Engine models varied significantly and are presented in Appendix C. Other

manufacturers included, but were not limited to, Deutz, Fairbanks-Morse, General Motors, John Deere, Case, Allis-Chalmers, Isuzu, and Perkins.

Figure III-2: Prime Engine Survey - Manufacturers

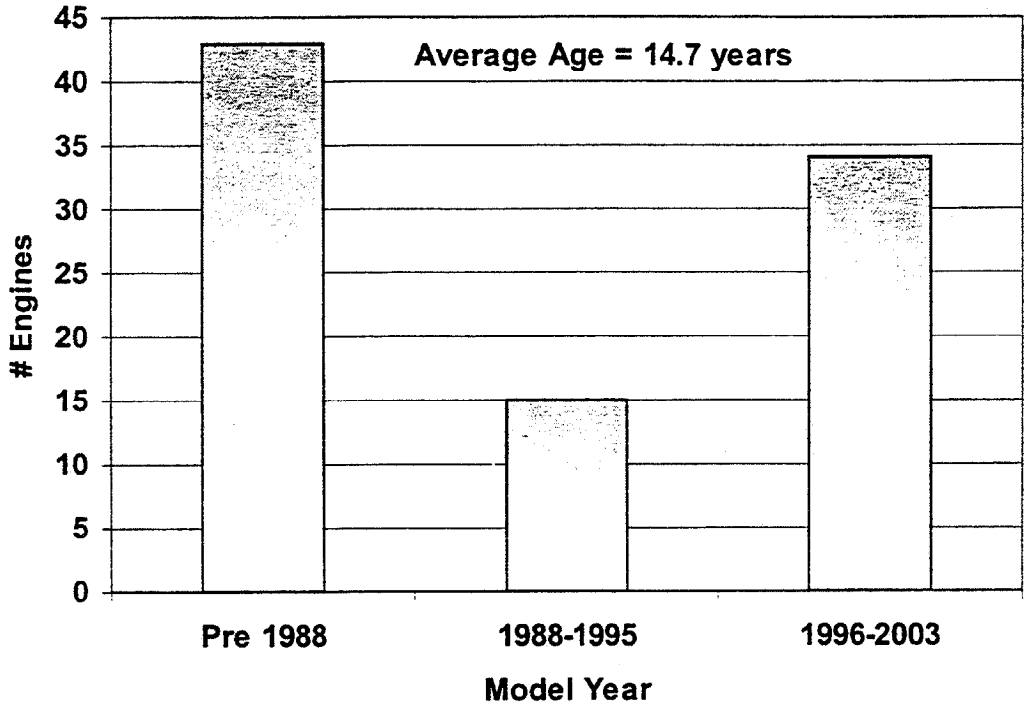


There were many different application types represented in the Prime Survey, such as air compressors, cranes, crushers, generators, grinders, hay compressors, pumps, turbine starters and wood chippers, to name a few. The largest number of engines were generators (33 percent), followed by cranes (15 percent).

Prime Survey engines ranged in horsepower from under 50 to over 2,000. The most populated categories were 300 to 599 horsepower, greater than 750 horsepower, and 100 to 174 horsepower, representing 66 percent of the survey engines. The average horsepower for all of the prime engines was 556.

Model year data was received for 92 of the 171 engines and sorted into three model year groups: pre-1988, 1988 to 1995, and 1996-2003 (see Figure III-3). About 53 percent of the engines were 1988 or newer, with 37 percent being model year 1996 or newer. The average age was approximately 15 years.

Figure III-3: Prime Engine Survey - Engine Model Years



Hours of operation data was collected for 132 engines, with an average annual amount of 953 hours. Average hours were calculated for each application and are shown in Table III-6.

Table III-6: Prime Engine Average Hours of Operation by Application

Application	Average Annual Hours
air compressor	334
cogeneration	5501
crane	1024
crusher	1114
generator	1563
grinder	798
hay compressor	1482
magnetic silencer	8
mud mixer	517
pump	46
sand blaster	313
turbine starter	22
winch	<50
wood chipper	869
other	852

Many of the engines from the Prime survey had advanced emission controls, such as diesel particulate filters (DPFs), diesel oxidation catalysts (DOCs), and selective catalytic reduction (SCR). Eighteen engines utilized at least one of these technologies, and several used one in conjunction with another (i.e., DPF with SCR).

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IV. EMISSIONS, POTENTIAL EXPOSURES, AND RISK

This chapter presents the most recent emissions inventory for stationary diesel-fueled engines in California as well as a discussion on the potential cancer health risks that may occur due to the operation of stationary diesel-fueled engines.

A. Estimated Emissions from Stationary Diesel-Fueled Engines

To develop an emissions estimate of the emissions from stationary diesel-fueled engines used in non-agricultural applications, ARB staff developed a methodology that integrated information from national engine sales data, local district permit data, and information collected in the ARB Surveys. Emission projections to 2020 were also developed using our best estimates of expected growth, engine turnover, and age distribution. For stationary diesel-fueled engines used in agricultural applications, ARB staff worked closely with the local districts and the agricultural community to create an estimate of the emissions from stationary diesel-fueled engines used in agricultural operations. Because of the limited data available for agricultural stationary engines, ARB staff was not able to project the emissions for future years with any degree of certainty. In this chapter, only emission estimates for the year 2001 are provided for stationary engines used in agricultural operations. Details of the methodologies and the supporting documentation are found in Appendix D. Based on the information available to date, we believe the methodologies have resulted in a reasonable estimate of the emissions from stationary diesel-fueled engines. However, upon implementation of the proposed ATCM, more detailed data will be available to allow for a more robust emissions estimate for non-agricultural (non-ag) applications in the July 2005 timeframe once engine operators submit the required information on engine characteristics and activity. We intend to also continue to work with agricultural representatives to refine the estimates for agricultural engines.

Current Emission Estimates for Stationary Diesel-Fueled Engines

We estimate that the operation of stationary diesel-fueled engines results in approximately 2.6 tons per day or 950 tons per year of diesel PM emissions. Of this, non-agricultural applications are responsible for approximately 40 percent (400 T/Y) of the emissions and agricultural applications about 60 percent (550 T/Y). In addition, based on an average statewide NOx to PM conversion factor of 0.1 $gNH_4NO_3/gNOx$, we estimate the secondary formation of PM_{10} nitrate from NOx emissions from diesel-fueled stationary engines to be about four tons per day.[9] Estimates for current statewide diesel PM, NOx, and NMHC emissions from all stationary diesel-fueled engines are presented in Table IV-1.

[9] The conversion factor for the transformation of NOx to NH_4NO_3 was based on a simplistic analysis of annual-average conversion factors for secondary formation of PM_{10} nitrate from NOx emissions at a number of urban sites in California. The values varied from 0.04 to 0.19 $gNH_4NO_3/gNOx$ depending on the site. To estimate the statewide secondary formation of PM_{10} from stationary engines, we assumed half the engines were in areas with a 0.19 $gNH_4NO_3/gNOx$ conversion rate and half in areas with a 0.04 conversion rate, resulting in an overall 0.1 $gNH_4NO_3/gNOx$ value.

Table IV-1: Stationary Diesel-Fueled Engines Year 2002 Emissions Estimates

Category	Number of Engines	Emission, Tons per Day			
		PM	NOx	ROG	CO
Prime	1,319	0.8	13.8	1.3	4.8
Agricultural Prime*	5,338	1.5	21.1	4.3	5.8
Emergency Standby	19,659	0.3	6.4	0.5	2.1
Total	26,321	2.6	41.3	6.1	12.7

*Emission estimates for agricultural engines are for 2001.

As shown in Table IV-1, there are approximately 26,000 stationary diesel-fueled engines in California. Of these, the majority, or 75 percent are used in emergency standby applications. However, because of the low operating hours for emergency standby engines, this category accounts for only about 10 percent of the total diesel PM emissions. A similar relationship is seen with the other pollutants as well. Prime applications (both agricultural and non-agricultural) are responsible for about 25 percent of the engines and about 90 percent of the diesel PM emissions. Agricultural engines (primarily irrigation pumps) are responsible for about 20 percent of the total number of stationary diesel-fueled engines in California.

Projected 2010 and 2020 Emission Estimates for Stationary Diesel-Fueled Engines Used in Non-Agricultural Applications

The projected uncontrolled emission estimates for the years 2010 and 2020 are presented in Table IV-2. As discussed in the methodology included in Appendix D, these estimates were developed using growth and control factors developed with input from district staff and representatives of several engine manufacturers. Those inputs include the number of diesel-fueled engines that enter the California non-ag stationary diesel-fueled engine population and the numbers of engines retired annually. These estimates include benefits from the new engine standards and turnover in the engine population but do not include the projected reductions expected from implementation of the proposed ATCM. Expected emission reductions and the impact on the emissions inventory are discussed in Chapter VIII, Environmental Impacts.

Table IV-2: Stationary Diesel-Fueled Engines Used in Non-Agricultural Applications Projected Uncontrolled Year 2010 and 2020 Emissions Estimates

	2010 Emissions, Tons per Day				2020 Emissions, Tons per Day			
Category	PM	NOx	ROG	CO	PM	NOx	ROG	CO
Prime	0.4	8.5	0.7	2.6	0.2	4.9	0.4	1.5
Emergency Standby	0.2	5.6	.4	1.7	0.1	4.6	0.2	1.4
Total	0.6	14.1	1.1	4.3	0.3	9.5	0.6	2.9

B. Potential Exposures and Risk from Diesel PM Emissions from Stationary Diesel-Fueled Engines

This section examines the potential exposures and cancer health risks associated with exposure to particulate matter emissions from stationary diesel-fueled engines. A brief qualitative discussion is provided on the potential exposures of Californians to the diesel PM emissions from stationary engines. In addition, a summary is presented of the health risk assessment conducted to determine the 70-year potential cancer risk associated with exposures to diesel PM emissions from stationary diesel-fueled engines. Additional details on the methodology used to estimate the health risks are presented in Appendix E of this report.

Potential Exposures

As discussed previously, stationary diesel-fueled engines are used in a variety of applications and contribute to ambient levels of diesel PM emissions. Because analytical tools to distinguish between ambient diesel PM emissions from stationary diesel-fueled engines from other sources of diesel PM do not exist, we cannot measure the actual exposures to persons from the emissions of stationary diesel-fueled engines. However, modeling tools can be used to estimate potential exposures to the emissions from stationary diesel-fueled engines.

Based on the most recent emissions inventory, there are over 26,000 stationary diesel-fueled engines operating in California. These engines are distributed throughout California. The majority of these engines are emergency standby engines, engines used to provide back-up power to hospitals, hotels, schools, businesses, water treatment facilities and the like. Engines used in emergency standby applications tend to be located in urban centers where the probability of a person living close to an emergency standby engine is higher. For example, based on the emissions inventory, approximately 40 percent of the total emergency standby engines statewide are located within the South Coast air basin and 80 percent are located within four air basins: San Francisco, San Diego, San Joaquin Valley, and South Coast. In September 2002, Environmental Defense published their results from a comprehensive study of the

impacts of operating emergency standby engines in California. The study was based on the California Energy Commission's database of emergency standby engines and concluded, among other things, that emergency standby engines tend to be located near where people live, work, and go to school. (Ryan, 2002) Based on this information, we believe that there are substantial exposures to diesel PM emissions from the operation of stationary diesel-fueled engines in California. As presented below these exposures can result in potential cancer health risks.

Health Risk Assessment

Risk assessment is a complex process that requires the analysis of many variables to simulate real-world situations. There are three key types of variables that can impact the results of a health risk assessment for stationary diesel-fueled engines – the magnitude of diesel PM emissions, local meteorological conditions, and the length of time someone is exposed to the emissions. Diesel PM emissions are a function of the age and horsepower of the engine, the emissions rate of the engine and the annual hours of operation. Older engines tend to have higher pollutant emissions rates than newer engines, and the longer an engine operates, the greater the total pollutant emissions. Meteorological conditions can have a large impact on the resultant ambient concentration of diesel PM, with higher concentrations found along the predominant wind direction and under calm wind conditions. How close a person is to the emissions plume and how long he or she breathes the emissions (exposure duration) are key factors in determining potential risk with longer exposures times typically resulting in higher risk.

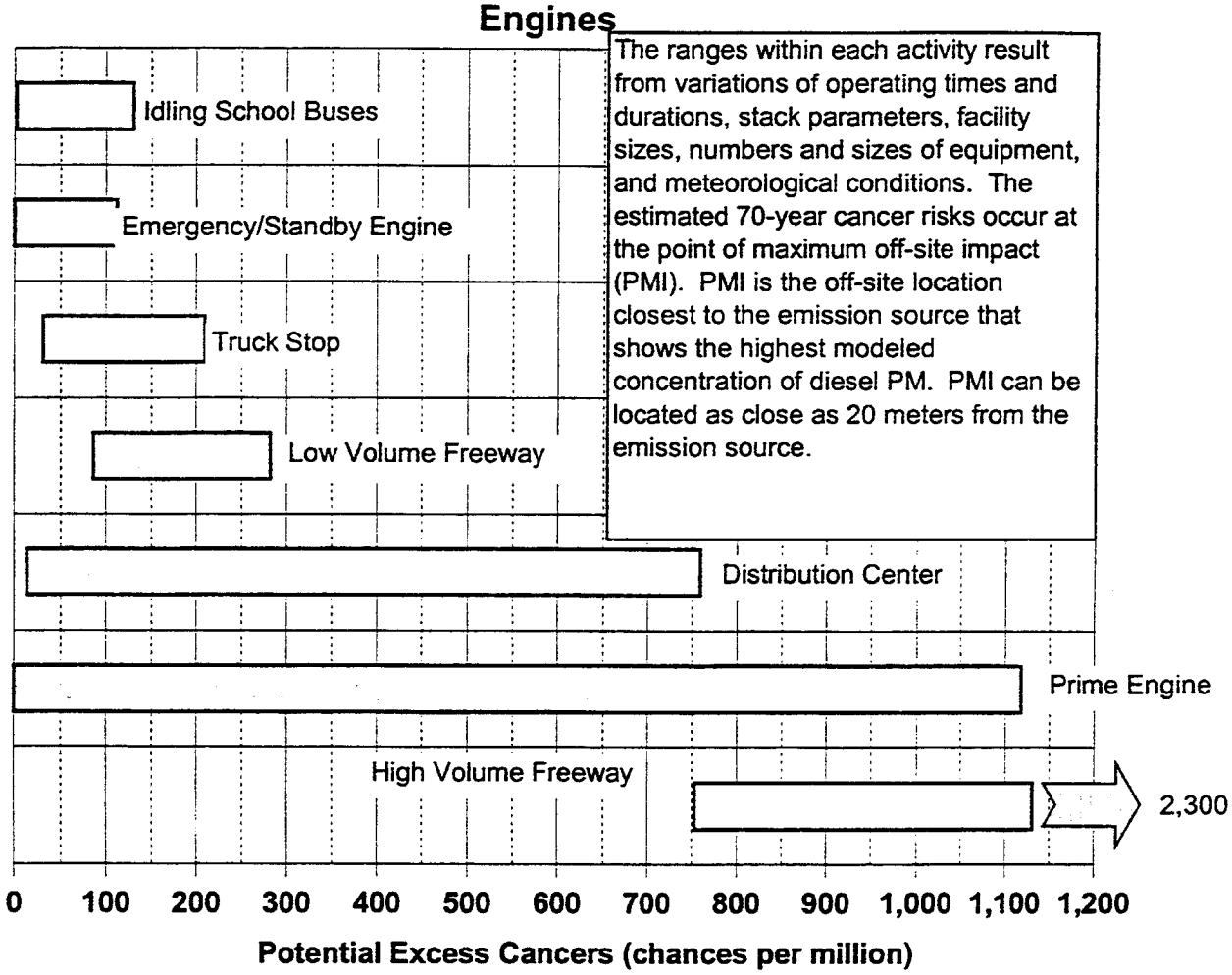
Because risk estimates for stationary diesel-fueled engines are dependent on numerous factors and because these factors vary from location to location, ARB staff developed a generic risk assessment for stationary diesel-fueled engines. We evaluated a range of emission rates and hours of operation bracketing a fairly broad range of possible operating scenarios. Meteorological data from West Los Angeles (1981) was selected to provide meteorological conditions with lower wind speeds and more persistent wind directions, which will result in less pollutant dispersion and higher estimated risk. The U.S. EPA's ISCST3 air dispersion model was used to estimate the annual average diesel PM concentration at the point of maximum impact.

The estimated annual average diesel PM concentrations were then adjusted following the current risk assessment methodology recommended by the Office of Environmental Health Hazard Assessment (OEHHA) and used by ARB in evaluating potential cancer risk from diesel PM emission sources. (OEHHA, 2002a) (OEHHA, 2002b) (OEHHA, 2000) Following the OEHHA guidelines, we assumed that the most impacted individual would be exposed to modeled diesel PM concentrations for 70 years. This exposure duration represents an "upper-bound" of the possible exposure duration. The potential cancer risk was estimated by multiplying the modeled current annual average concentrations of diesel PM, adjusted for the duration of exposure, by the unit risk factor for diesel PM (300 excess cancers per million people/microgram/cubic meter of diesel PM).

Based on our analysis under the conditions outlined above, the estimated cancer risk for persons most exposed to the emissions from emergency standby diesel-fueled engines ranged from near 0 to over 100, and for prime from near 0 to well over 1,000. The low end in each case represents a very clean engine operating only a few hours annually and the high end, an engine with a relatively high emission rate operating for many hours each year. As shown in Figure IV-1 on the next page, when compared to other activities using diesel-fueled engines, it can be concluded that stationary diesel-fueled engines, particularly those in prime applications, can pose significant near-source risks to populations living in close proximity to the engines.

The estimated risk levels presented here are based on a number of assumptions. The potential cancer risk for actual situations may be less than or greater than those presented here. For example, an increase in the emissions rate of an engine or the annual hours of operation would increase the potential risk levels. A decrease in the exposure duration or an increase in the distance from the engine would decrease potential risk levels. The estimated risk levels would also decrease over time as newer, lower-emitting stationary diesel-fueled engines replace older engines. Therefore, the results presented are not directly applicable to any particular stationary engine. Rather, this information provides an indication as to the potential relative levels of risk that may be attributed to stationary diesel-fueled engines and to act as an example when performing a site-specific risk assessment for stationary diesel-fueled engines.

Figure IV-1: Cancer Risk Range of Activities Using Diesel-Fueled Engines



(Note: The risk ranges for the non-stationary engine scenarios are taken from the DRRP. The upper bounds have been adjusted to reflect the 95th percentile breathing rate. The upper bounds for the emergency standby and prime stationary engines are for 0.55 g/bhp-hr engines operating 100 hr/yr and 2,000 hr/yr, respectively.)

REFERENCES:

Office of Environmental Health Hazard Assessment. *Air Toxics Hot Spots Program Risk Assessment Guidelines: The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*; 2002. (OEHHA, 2002a)

Office of Environmental Health Hazard Assessment. *Air Toxics Hot Spots Program Risk Assessment Guidelines, Part II, Technical Support Document for Describing Available Cancer Potency Factors*; 2002. (OEHHA, 2002b)

Office of Environmental Health Hazard Assessment. *Air Toxics Hot Spots Program Risk Assessment Guidelines, Part IV, Technical Support Document for Exposure Analysis and Stochastic Analysis*; 2000. (OEHHA, 2000)

Ryan, Nancy E., et al. *Smaller, Closer, Dirtier DIESEL BACKUP GENERATORS IN CALIFORNIA*, Environmental Defense; September 2002. (Ryan, 2002)

V. SUMMARY OF PROPOSED CONTROL MEASURE FOR STATIONARY COMPRESSION IGNITION ENGINES

In this chapter, we provide a plain English discussion of the key requirements of the proposed air toxic control measure (ATCM) for new and in-use stationary diesel-fueled compression ignition (CI) engines. This chapter begins with a general overview of the ATCM and the approach we took in developing the emission standards and operational limits defined by the ATCM. The remainder of the chapter is structured in accordance with the structure of the ATCM. Each major requirement of the ATCM is discussed and explained. This chapter is intended to satisfy the requirements of Government Code section 11343.2, which requires that a noncontrolling "plain English" summary of the regulation be made available to the public.

A. Overview of the ATCM

The proposed ATCM establishes requirements for new and in-use stationary CI engines. The requirements fall in three major categories: fuel-use requirements, operational requirements and emission standards, and recordkeeping and reporting requirements. In general, the fuel-use requirements and the recordkeeping and reporting requirements apply to all stationary CI engines and the operational requirements and emission standards only apply to stationary *diesel-fueled* CI engines[10].

Our approach in developing the operational requirements and emission standards for stationary diesel-fueled CI engines was to establish requirements and standards that are based on the application of the best available diesel PM control strategies for emergency standby and prime applications. Factors considered when establishing requirements included potential near-source risk, cost of controls, availability of U.S. EPA or ARB off-road certified engines that can meet the proposed stationary engine emission standards, and the availability of viable control technologies for stationary engine applications. This approach to developing requirements is reflected in the differing requirements for emergency standby and prime engines, and the establishment of specific exemptions.

The following subchapters discuss and explain the key requirements of the ATCM in more detail.

B. Purpose

The purpose of this ATCM is to reduce diesel particulate matter (PM) emissions and the associated potential cancer risks from stationary diesel-fueled engines. Diesel PM emission reductions are needed to reduce the risk to people who live in the vicinity of these engines and to reduce the contribution these engines make toward the overall

[10] There is a broad-based exception to the general fuel–use requirements. In-use stationary CI engines that are not diesel-fueled, are not subject to the fuel-use requirements. See subchapter F for further discussion.

regional exposures to diesel PM. More specifically, the purpose of the ATCM is to 1) establish a record of where stationary CI engines are located, what fuel they use, and how they are operated; 2) require new and in-use stationary CI engines to meet specified fuel requirements, operating requirements, and emission standards; and 3) require non-diesel-fueled new and in-use stationary CI engines to meet specified fuel requirements.

C. Applicability and Effective Date

The proposed ATCM establishes requirements that apply to any person who sells, offers for sale, leases, or purchases a stationary CI engine for use in California. Further, the proposed ATCM establishes emission limitations and operational requirements that apply to the owners and operators of stationary CI engines with a rated horsepower greater than 50.

The effective date of the ATCM is no later than 30 days after the approval of this subsection by the Office of Administrative Law and the adoption of the ATCM into Title 17 of the California Code of Regulations. After adoption, the requirements of the ATCM are required to be implemented and enforced by each air pollution control and air quality management district (district). Each district has the choice of either implementing and enforcing the ATCM or adopting its own rule that differs from the ATCM but is as stringent. If a district chooses to implement and enforce the requirements of this section, it must do so by no later than 120 days after the effective date. If the district chooses adopt its own rule, that rule must be implemented and enforced no later than six months after the effective date.

D. Exemptions

The proposed ATCM identifies several specific engine applications that are exempt from all or part of the fuel use, operating requirements, emission standards, or recordkeeping and reporting requirements. In general, the exemptions are provided to address specific situations where the impact of the emissions on nearby receptor locations is considered minimal and it is not practical to comply with the requirements of the proposed ATCM due to high costs or technical issues associated with controlling diesel PM emissions. Table V-1 identifies each exempted category of engine and the terms of the exemption. The exemption numbers correspond to the exemption numbers found in section (c), Exemptions, of the ATCM.

Table V-1: Summary of Exemptions

Exempted Category	Terms of the Exemption
1) Portable CI engines, on-road and off-road vehicle engines[11]	- non-stationary CI engines are exempt from all requirements
2) Marine vessel engines[2]	- non-stationary CI engines are exempt from all requirements
3) In-use stationary CI engines used in agricultural operations	- exempt from all requirements. - on-going efforts to identify how to reduce emission
4) New stationary CI engines used in agricultural operations	- Separate requirements/standards established for new agricultural engines. Exempt from operational requirements and emission standards for non-agricultural engines.
5) Single cylinder cetane test engines	- exempt from operating requirements and emission standards.
6) In-use stationary CI engines subject to requirements of *Risk Management Guidance, October 2000*	- exempt from operating requirements and emission standards if meet Risk Management Guidance requirements
7) In-use emergency standby stationary CI engines at hospitals with approved OSHPD Plans that require engine replacement	- exempt from operating requirements and emission standards
8) Stationary diesel-fueled CI engines used solely for the training of military personnel	- exempt from all the requirements except recordkeeping and reporting
9) Stationary diesel-fueled engines operating on San Clemente and San Nicolas Islands	- exempt from all requirements except recordkeeping and reporting.
10) Stationary diesel-fueled engines operating on outer continental shelf platforms	- exempt from operating requirements and emission standards
11) In-use emergency standby stationary diesel-fueled CI engines used solely for the safe shutdown and maintenance of a nuclear facility when normal power service fails or is lost	- exempt from operating requirements and emission standards.
12) In-use prime stationary diesel-fueled CI engine located beyond school boundaries that operates no more than 20 hours per year	- exempt from emission standards.
13) In-use stationary dual-fueled diesel-pilot CI Engines that use an alternative diesel fuel or an alternative fuel	- exempt from all requirements except recordkeeping and reporting
14) Stationary dual-fueled diesel-pilot CI engines that use digester gas or landfill gas	- exempt from all requirements except recordkeeping and reporting
15) In-use stationary diesel-fueled CI engines that have selective catalytic reduction (SCR) systems	- exempt from all requirements except recordkeeping and reporting
16) In-use emergency standby stationary diesel-fueled CI engines used as direct-drive fire pump engines	- exempt from emission standards and operating requirements
17) Stationary diesel-fueled CI engines owned by NASA and used solely at space shuttle landing sites	- exempt from all the requirements except recordkeeping and reporting

[11] Portable engines, on-road and off-road vehicles, and marine vessel engines will be addressed in other ATCMs.

In the following paragraphs, we discuss the rationale for establishing several of the exemptions.

Exemptions 3 and 4: Agricultural Engines

The proposed ATCM exempts in-use stationary CI engines used in agricultural operations (agricultural engines) from all requirements and establish a separate set of requirements for new agricultural engines which are presented in subchapter G.5. The reasons why in-use agricultural engines were not included in this ATCM are discussed in detail in Chapter X, Additional Considerations. In short, factors that influenced our decision to exempt in-use agricultural engines and define separate requirements for new agricultural engines included: 1) retrofit installation and availability issues unique to engines in agricultural service, and 2) implementation and enforcement constraints. Although in-use agricultural engines are currently exempt, ARB staff is continuing its efforts to determine how best to further reduce diesel PM emissions from these engines.

Exemption 6: Engines in Compliance with the *Risk Management Guidance for the Permitting of New Stationary Diesel-fueled Engines, October 2000 (Guidance)*

The proposed ATCM exempts in-use stationary diesel-fueled CI engines from the fuel requirements, emission standards, and operational requirements, if these engines are in compliance by January 1, 2005, with the requirements of the Guidance. The Guidance is a non-regulatory permitting guidance document to assist districts in making risk management decisions associated with the permitting of new stationary diesel-fueled CI engines. The requirements of the Guidance are summarized in the Table V-2.

Table V-2: Summary of Recommended Permitting Requirements for New Stationary Diesel-Fueled Engines Defined in the *Risk Management Guidance*, October 2000

Engine Category	Annual Hours of Operation	Group	Performance Standard[1] (g/bhp-hr)	Minimum Technology Requirements			Additional Requirements	
				New Engine PM Emission Levels[1] (g/bhp-hr)	Fuel Technology Requirements	Add-On Control	HRA Required	SF Report
Emergency Standby > 50 hp	≤ 100 hours[2]	1	0.15	0.15	CARB Diesel or Equivalent	No	No	No
All Other Engines > 50 hp	≤ 400 hours	1	0.02	0.15	Very low-sulfur CARB Diesel or equivalent [4]	Catalyst-based DPF or equivalent	No	No
	> 400 hours	2	0.02	0.15	Very low-sulfur CARB Diesel or equivalent [4]	Catalyst-based DPF or equivalent	Yes	If HRA shows risk > 10/million

HRA - Health Risk Assessment; SF - Specific Findings; DPF - Diesel Particulate Filter

1. ISO 8178 test procedure IAW *California Exhaust Emission Standards and Test Procedures for New 1996 and Later Off-Road Compression–Ignition Engines, May12, 1993.*
2. The annual hours of operation for emergency standby engines include the hours of operation for maintenance and testing runs only.
3. The Guidance only required very low sulfur (≤ 15 ppmw) CARB diesel or equivalent be used in areas where the district determines it is available in sufficient quantities and economically feasible to purchase. CARB diesel is required to be used in all other areas.

The performance standards and minimum technology requirements of the Guidance are consistent with the requirements of the ATCM. The requirement for a site-specific health risk assessment (HRA) is not specifically identified in the ATCM. We do not believe that a site-specific risk assessment is necessary in a most cases when a prime engine is meeting either 0.02 g/bhp-hr emission limit, or an 85 percent reduction from baseline levels. Our screening level risk analysis[12] estimates that risk from prime engines in compliance with the ATCM requirements will be below 10/million when operating 1000 hours year, which is approximately the average annual hours prime engines operate (Appendix C, Prime Stationary Diesel-Fueled Engine Survey). However, the ATCM does not preclude a district from requiring a site-specific HRA, should the anticipated hours of operation significantly exceed 1000 hours per year.

[12] The estimated cancer risks from engines meeting the requirements of the ATCM are based on the estimated diesel PM concentration at the point of maximum impact as determined using air dispersion modeling. See Appendix E, Stationary Diesel-Fueled Engines Health Risk Assessment, for a detailed discussion of how the estimated risk was determined and estimated risk values posed by engines of differing sizes and hours-of-operation.

Exemption 11: Emergency Standby Engines used solely for the safe shutdown and maintenance of a nuclear facility when normal power service fails or is lost.

Currently, there are two active nuclear power plants in California: 1) the Diablo Canyon Nuclear Power Plant, Avila Beach operated by the Pacific Gas and Electric Company (PG&E), and 2) the San Onofre Nuclear Generating Station, San Clemente, operated by the Southern California Edison Company. Both have emergency standby stationary diesel-fueled CI engines that provide power for the emergency core cooling and other vital functions for the safe shutdown of the nuclear power plant. These engines are generally large – around 3,000 horsepower. The six at Diablo Canyon are Alco Model 18-251 rated at 3,630 bhp. (PG&E, 2003) The eight at San Onofre are configured in tandem. Four pairs each consisting of a 2,879 bhp and 3,800 bhp engine. (San Diego, 2003) Based on emission test data from similar engines, the diesel PM emission rate for each engine is estimated to be in the 0.30 g-bhp-hr to 0.14 g/bhp-hr range (Fairbanks Morse, 2000). Operating records from both Nuclear Plants indicate that they have been able to operate at less than 150 hours per year for maintenance and testing purposes. The San Onofre Engines are permitted, and are limited to 200 hours of operation for maintenance and testing purposes. (SDCAPCD, 2003) The Diablo Canyon engines are currently exempt from permit requirements, however, the annual hours operated for maintenance and testing over the last three years ranged from 26 to 99 hours per engine. (PG&E, 2002) These engines are contained in hardened buildings and subject to stringent design and operational requirements.

The proposed ATCM allows each district APCO the authority to approve a Request for Exemption from the operational requirements and emission standards of the ATCM for any in-use emergency standby stationary diesel-fueled CI engine that is used solely for the safe shutdown and maintenance of a nuclear facility. The Request for Exemption may be approved for emergency standby engines that meet the following criteria:

- the engine is an emergency standby engine used solely for the safe shutdown and maintenance of nuclear facility when normal power service fails or is lost
- the engine is subject to the requirements of the Nuclear Regulatory Commission
- the engine is limited to 200 hours or less per year
- the district specifies any additional criteria that must be met. Additional criteria can include but is not limited to on-site reductions in diesel PM emissions from other diesel-fueled engines or vehicles operating at the nuclear facility, off-site reductions in diesel PM emissions from diesel-fueled engines or vehicles, and site-specific considerations that could be employed to minimize the impact of the engines diesel PM emissions.

These engines are given this exemption because they provide for the safe-shutdown of a nuclear facility and as such are subject to unique requirements (hardened buildings, Nuclear Regulatory Commission required failure mode analysis) that make retrofitting or replacing the engines extremely costly; there is an environmental benefit to there continued operation should they ever be called on in an emergency; and they are

limited in the hours of operation which limits the potential diesel PM exposure resulting from there operation. (ARB, 2002) In addition, the districts have the authority to require the owners or operators to provide additional on-site or off-site reductions in diesel PM emissions should the risk from these engines exceed acceptable levels.

It should be noted that although the potential risk from one engine operating 200 hours per year is less than 10/million, the cumulative risk from all six or eight engines operating 200 hours per year at each facility may exceed district significant risk levels and be subject to additional requirements.

Exemption 12: Prime engines that operate no more than 20 hours per year

The proposed ATCM allows each district APCO the authority to approve a Request for Exemption from the emission standards of the ATCM for low-use prime engines operated outside of school boundaries. The Request for Exemption may be approved for prime engines that meet the following criteria:

- The district APCO must grant the delay in implementation in writing.
- The following conditions must be met:
  - the engine is a prime engine
  - the engine is located no more than 1000 feet from a school at all times
  - the engine operated no more than 20 hours per year cumulatively.

This exemption is being proposed in consideration of the potential risks from one engine and the significant cost to meet the requirements for prime engines. The health risk posed to receptors that are exposed to exhaust from these engines is estimated at less than 10 in a million at the point of maximum concentration given these engines operate for less than 20 hours cumulatively per year.[13] In addition, for an average size (700 horsepower) stationary diesel-fueled prime CI engine, the cost to retrofit or replace an engine to comply with the 85 percent reduction in PM emissions or the 0.01 g/bhp-hr diesel PM emission rate for compliance is estimated to range from $26,000 to $92,000.

Exemptions 13 and 14: Dual-fueled engines

The proposed ATCM exempts certain types of dual-fueled engines from the fuel requirements, operational requirements, and emission standards of the ATCM. A dual-fuel engine is any CI engine that is designed to operate on a combination of alternative fuel and conventional liquid fuel, such as gasoline or diesel. These engines have two separate fuel systems, which either inject both fuels simultaneously into the engine

[13] The estimated cancer risks from engines meeting the requirements of the ATCM are based on the estimated diesel PM concentration at the point of maximum impact as determined using air dispersion modeling. See Appendix E, Stationary Diesel-Fueled Engines Health Risk Assessment Methodology, for a detailed discussion of how the estimated risk was determined and estimated risk values posed by engines of differing sizes and hours-of-operation.

combustion chamber or fumigate the gaseous fuel with the intake air and inject the liquid fuel into the combustion chamber.

In-use dual-fueled diesel-pilot engines that use an alternative fuel or an alternative diesel fuel are exempt from the fuel requirements and emission standards of the ATCM. The term "diesel-pilot" refers to the use of a small amount of diesel fuel as an ignition source for an alternative fuel that would otherwise not combust, or combust incompletely, when used in a CI engine. The definition of "small amount" for purposes of this ATCM is 5 parts diesel fuel to 100 parts total fuel on an energy equivalent basis. The reasons why we chose to exempt them are listed below and discussed in detail in Chapter X, Additional Considerations.

- These engines represent an 85 percent reduction in diesel PM emissions from a 100 percent diesel-fueled CI engine.
- The emissions from these engines will be included in the facility-wide emission inventory/risk assessment requirements of AB 2588 ("Hot Spots" Program).
- Recordkeeping and reporting information is required. We will reevaluate the health risk posed by exposure to the exhaust of these engines at a later date.

All dual-fueled diesel-pilot engines that use digester gas or landfill gas are exempt from the fuel requirements, operational requirements, and emission standards of the ATCM. Digester gas is any gas derived from anaerobic decomposition of organic matter. Digester gas is produced at wastewater treatment plants. Landfill gas is any gas derived through any biological process from the decomposition of waste buried within a waste disposal site. The reasons why we chose to exempt dual-fueled diesel-pilot engines that use digester gas or landfill gas are listed below.

- The number of these engines is relatively small (less than 10)
- Digester gas and landfill gas is unconditioned and contains a compound called Siloxane. Siloxane, which is silicon based, clogs the catalyst beds of catalyzed emission control equipment. This reduces the availability of sites where the catalytic reaction can occur and ultimately renders the catalyst inoperable. It should be noted that installation of a pretreatment system to remove Siloxane prior to combustion in the engine is possible, and will allow a catalytic control system to operate on digester and landfill gases. However, the cost to install and maintain such a system is substantial and is the reason why these pretreatment systems are not currently operating anywhere in the country.
- There are environmental benefits to using digester or landfill gas that would otherwise be flared.
- Requiring recordkeeping and reporting information is required. We will reevaluate the health risk posed by exposure to the exhaust of these engines at a later date.

Exemption 15: In-Use Engines with SCR systems

The proposed ATCM exempts in-use stationary diesel-fueled engines that have installed selective catalytic reduction systems (SCR) from the emission limit and operating requirements. Currently, ARB staff is aware of only 12 stationary diesel-fueled CI engines with SCR systems installed. These engines are exempt because of the high costs and technical issues associated with installing diesel particulate matter control technologies on engines that already have SCR systems in place. For in-use engines with SCR systems currently installed additional cost would be associated with removing the SCR system to accommodate the installation of a DPF. The cost of installing an SCR system is significant. It can typically range from the $50 to $60/hp range, compared to about $40/hp for a DPF. (ARB, 2000) As a rule, DPFs should be installed prior to the SCR to avoid exposure to reductant slip and to facilitate the regeneration of the filter element through the exposure to high (300° C) exhaust temperatures. Although these engines are exempt from the emission standards and operating requirements of the proposed ATCM, they are still subject to local District regulations, rules, and policies. It is at that level that we believe it is most appropriate for diesel PM emission standards and operating requirements be developed for in-use engines with SCR systems.

Exemption 16: In-Use Stationary Diesel-Fueled CI Engines used as Direct-Drive Fire Pump Engines

In-use emergency fire pump assemblies that are driven directly by stationary diesel-fueled CI engines and are operated the hours necessary to comply with the testing requirements of NFPA 25, are not subject to the emission standards or operating requirements of the proposed ATCM. (NFPA25) Staff estimates this effects a very small fraction - less than one percent of the fire pump engine population. The NFPA 25 standard requires maintenance and testing operation from 29 to 34 hours per year. ARB staff is aware that this exceeds the 20 hour maximum set for uncontrolled engines, and may exceed the 30 hour maximum set for engines that meet the 0.40 g/bhp-hr standard, but this exemption is warranted because retrofitting these engines with emission control devices may compromise the Underwriters Laboratory (UL) certification of these engines, and replacement of these engines is likely to be cost prohibitive.

E. Definitions

The proposed ATCM provides definitions of all terms that are not self-explanatory. All totaled, there a 54 definitions provided in the ATCM to help clarify and enforce the regulation requirements. In this subchapter, we discuss the definitions for the key terms used throughout this chapter.

1. CARB Diesel Fuel: CARB Diesel Fuel is any diesel fuel that meets the specifications defined in Title 13, California Code of Regulations, sections 2281-2282, and section 2284. These regulations set standards on

sulfur content, aromatic content, and fuel lubricity. These regulations s also allow producers and importers of diesel fuel to comply with the regulations by qualifying through testing alternative CARB diesel fuel formulations. Alternative CARB diesel fuel formulations could include diesel fuels that are mixtures of diesel fuel and alternative diesel fuels, e.g., biodiesel.

2. New Engine: A "new" engine is an engine that was installed at a facility after January 1, 2005. The term "new" is specifically defined in the proposed ATCM. In general, a new engine is one that was installed after January 1, 2005. It doesn't matter if it were never used before (i.e., "brand-new"), or is a previously used engine. If it is new to the facility, then it is required to meet the new engine emission standards and operational limits. There are specific exceptions to this general definition of a new engine. Temporary replacement engines are not considered new engines. Engines approved for installation prior to effective date of the ATCM, but not installed until after January 1, 2005, are not considered new. An engine that is one of four or more engines owned by a single owner and relocated prior to January 1, 2008, to an offsite location owned by the same owner or operator engine is not considered new. An engine used in agricultural operations and is relocated to an offsite location owned by the same owner or operator is not considered new. Engines that fall into these exception categories are considered to be in-use engines and are subject to in-use engine requirements.

   The proposed ATCM establishes a separate set of requirements for new stationary diesel-fueled CI engines used in agricultural operations. Prior to January 1, 2008, new engines that were originally funded under a State or federal incentive funding program, e.g., California's Carl Moyer Program or the U.S. Department of Agriculture's Environmental Quality Incentives Program (EQIP), are exempt from these requirements.

3. In-Use Engines: An "in-use engine" is one that was installed at a facility prior to or on January 1, 2005. It is defined in the ATCM as an engine that is not a new engine.

4. Stationary CI Engine: "Stationary CI Engine" means a CI engine, such as an electric power generator set, grinder, rock crusher, sand screener, crane, cement blower, air compressor, and water pump, that is it is physically attached to a foundation, or remains at the same stationary source for more than 12 consecutive rolling months or 365 rolling days, whichever occurs first. This 12 month/365 day time period does not include time spent in a storage facility at the facility. There is also a special provision for "seasonal sources". A seasonal source is a CI engine that operates for at least three consecutive or nonconsecutive months per year for at least two years. Seasonal source engines are considered stationary CI engines. If a CI engine is moved from one facility to another or one location to another location in the same facility

such that, under the totality of the circumstances, the district APCO determines the movement of the engine is an attempt to circumvent the 12 consecutive rolling month requirement discussed above, that engine is considered to be a stationary CI engine. This definition is consistent with the definition of portable equipment found in the ARB's Portable Equipment Registration Program (Title 13 CCR sections 2450-2466).

5. Maintenance and Testing: "Maintenance and testing" means operating an emergency standby engine during maintenance of the engine or the supported equipment; or operating the engine to test the engine's ability to perform during an emergency, or the supported equipment's ability to perform during an emergency. "Maintenance and testing" does not include testing to show compliance with this ATCM or other district policies, rules, or regulations. Compliance testing for showing compliance with the requirements of this ATCM is not limited. Hours of operation for demonstrating compliance with other District policies, rules, or regulations are left to district discretion.

6. Emergency standby engine: Emergency standby engines are used to provide electrical power or mechanical work in the event of an emergency. What constitutes an emergency is specifically defined in the ATCM. In general, an emergency is a power outage, fire, flood, or sewage overflow. An emergency also includes the failure of a facilities internal power distribution system. An example of this would be if a ski resort looses power to its ski lift operations due to a line failure at the resort.

7. Prime engine: Prime engines are defined in the ATCM as engines that are not emergency standby engines. Prime engines are used in a wide variety of applications, including compressors, cranes, generators, pumps (including agricultural pumps), and grinding/screening units.

F. Fuel Use Requirements

The proposed ATCM specifies fuel use requirements and fuel additive requirements for all new stationary CI engines and all in-use stationary diesel-fueled CI engines. The fact that the term "diesel-fueled" is missing when defining the universe of 'new" engines affected by these requirements is not an oversight. Our policy is to hold all new stationary CI engines to the most stringent standards. This means all new CI engines, not just new diesel-fueled CI engines, must use fuels that meet the requirements identified in the ATCM. Conversely, in-use stationary CI engines that currently use non-diesel fuels are not subject to the fuel-use requirements. ARB staff considers the continued use of a non-diesel fuel to represent an appropriate fuel-use requirement for an in-use stationary CI engine.

The proposed ATCM requires all new stationary CI engines and all in-use stationary diesel-fueled engines to use either:

- CARB Diesel Fuel
- An alternative diesel fuel that meets the requirements of the Verification Procedure (which includes a multimedia impact assessment.)
- An alternative fuel (e.g., CNG, LPG)
- CARB diesel fuel used with a fuel additive that meets the requirements of the Verification Procedure
- Any combination of the above

As with all requirements, there are exemptions to the fuel and fuel additive requirements. These exemptions are identified in subchapter D and address non-stationary engines, in-use stationary CI engines used in agricultural operations, cetane test engines, specific types of military training engines, engines operating on San Clemente or San Nicolas Islands, engines operating on OCS platforms, and certain stationary dual-fueled diesel-pilot CI engines, and stationary engines owned by NASA and operating at space shuttle landing sites.

G. Operating Requirements and Emission Standards

This subchapter is comprised of six parts. Parts 1 and 2 summarize the operating requirements and emission standards for emergency standby stationary diesel-fueled CI engines with a rated horsepower greater than 50. Parts 3 and 4 summarize the operating requirements and emission standards for prime stationary diesel-fueled engines with a rated horsepower greater than 50. Part 5 summarizes the emission standards for new stationary diesel-fueled CI engines used in agricultural operations with a rated horsepower greater than 50. Part 6 summarizes the emission standards for new stationary diesel-fueled CI engines with a rated horsepower less than or equal to than 50.

This chapter does not discuss the basis for the emission standards and operating requirements. For a detailed discussion of the reasons why the emission standards and operational limits are defined in the ATCM as they are, see Appendix F, Basis for the Standards.

1. Operating Requirements and Emission Standards for New Emergency Standby Stationary Diesel-Fueled CI Engines with a Rated Horsepower Greater than 50

General Operating Requirements and Emission Standards

The emission standards, operational requirements, and compliance dates for new emergency standby diesel-fueled CI engines are summarized in Table V-3.

Table V-3: Diesel PM Standards and Operational Requirements for New Emergency Standby Stationary Diesel-Fueled Engines

Diesel PM Standards (g/bhp-hr)	NMHC/NOx/ CO Standards (g/bhp-hr)	Maximum Allowable Annual Hours of Operation for Engines Meeting Diesel PM Limit			Compliance Dates
		Emergency Use	Non-Emergency Use		
			Emission Testing to show compliance[2]	Maint. & Testing (hours/year)	
≤ 0.15[1]	Off-road Standard (Appropriate or Tier 1)	Not Limited by ATCM[3]	Not Limited by ATCM[3]	50	January 1, 2005
≤ 0.01[1]		Not Limited by ATCM[3]	Not Limited by ATCM[3]	District Discretion but may not exceed 100	

1. Or off-road certification standard (title 13 CCR section 2423) for an off-road engine with the same horsepower rating, whichever is more stringent
2. Emission testing limited to testing to show compliance with subsections (e)(2)(A)(ii).
3. May be subject to emission or operational restrictions as defined in current applicable district rules, regulations, or policies.

The proposed ATCM establishes requirements for both the sellers and operators of new stationary diesel-fueled engines. As shown in Table V-3, the proposed ATCM establishes diesel PM emission standards that become more stringent as the maximum allowable annual hours for maintenance and testing increase. Persons selling purchasing or leasing new emergency standby stationary diesel-fueled CI engines are required to meet the emission standards summarized in Table V-3. Engines that operate less than of equal to 50 hours per year for maintenance and testing purposes are required meet a diesel PM emission limit of 0.15 g/bhp-hr, or the off-road certification standard (title 13 CCR section 2423) for an off-road engine with the same horsepower rating, whichever is more stringent. If an owner or operator needs to operate his or her engine more than 50 hours per year for maintenance and testing purposes, the District will determine the emission standards and operating requirements for that engine on a site-specific basis with the following restrictions. In no case shall the diesel PM emission rate of the engine be greater than 0.01 g/bhp-hr and in no case shall the total number of annual hours of operation for maintenance and testing purposes exceed 100. The criteria to be considered by the District when making this decision include the NOx emission rate of the engine, the existence of additional diesel-fueled engines operating on-site, and current and planned use of surrounding land.

The proposed ATCM also requires all new stationary diesel-fueled CI engines to meet the appropriate off-road standard for HC, NOx, or NMHC+NOx, and CO, as defined in Title 13 CCR section 2423. For example, if the new stationary diesel-fueled CI engine has a rated brake horsepower (hp) of 250 hp and is a 2003 model year engine, then the appropriate off-road standards would 4.9 g/bhp-hr for NMHC+NOx, and 2.6 g/bhp-hr for CO (also referred to as Tier II standards). Similarly, if the new engine is an older model, lets say a 250 hp, model year 1997, then the appropriate off-road standard would be 1.0 g/bhp-hr for HC, 6.9 g/bhp-hr for NOx, and 8.5 g/bhp-hr for CO (also referred to as

Tier I standards). If the engine pre-dates the off-road standards, for example a 1987 model year engine, the appropriate standard would default to the Tier I standard for the horsepower rating category of the engine. For the greater than 50 hp to less than 175 hp category of engines, the Tier I standard defines emission standards for NOx only. For these engines, there would be no emission standards for HC or CO.

The proposed ATCM does not limit the number of hours of emergency use operation. As discussed in Appendix F, Basis for the Standards, the number of hours for emergency use operation for a typical emergency standby engine is relatively small when compared to the hours of operation for maintenance and testing. This, coupled with the fact that the owner or operator can directly control the number of hours of operation for maintenance and testing, led us to establishing upper limits for maintenance and testing hours only.

The ATCM does not limit the number of hours of operation for ATCM compliance testing. ATCM compliance testing is a one-time event and is only required when emission test data is not already available. See subchapter I, Emissions Data, for a discussion on the types of information that can be submitted to the district APCO to show compliance with the emission standards of the ATCM.

The proposed ATCM does not establish any ongoing testing requirements for purposes of enforcement of the requirements beyond initial compliance testing. Ongoing compliance is left to each individual District. However, to facilitate a District's ongoing compliance program, the proposed ATCM does require ongoing recordkeeping and reporting requirements as well as the monitoring equipment requirements (see subchapter H, Reporting, Notification, Recordkeeping, and Monitoring Requirements).

Interruptible Service Contract Engines

An interruptible service contract (ISC) is a voluntary arrangement between a non-residential electrical customer and an electrical service provider where the customer agrees to reduce its electrical consumption during periods of peak demand in exchange for compensation. Currently, the proposed ATCM classifies a new engine used to provide power in a "non-emergency" situation, e.g., the fulfillment of an ISC contract, as a new prime engine, not an emergency standby engine, and is subject to the new prime engine emission standards discussed in subchapters G(3) and G(4). Some stationary diesel-fueled engine owners under existing ISC contracts argued that the current approach sets emission standards that are too stringent, given that ISC contracts help prevent blackouts which could result in widespread use of diesel-fueled engines during a blackout. Others argued against easing the current approach, raising concerns about the potential for elevated near source exposures to diesel PM from ISC engines. ARB staff will continue to meet and confer on this issue and may provide a modified proposal to the Board at the November 13-14, 2003 hearing.

District's Authority to Establish More Stringent Standards and Allow Additional Hours of Operation

The ATCM clarifies that the district Air Pollution Control Officer (APCO) has the authority to establish more stringent emission standards and operating requirements, and to allow additional hours of operation for demonstrating compliance with other District rules, Verification testing, and initial start-up testing.

The authority to establish more stringent emission standards and operating requirements is consistent with the requirements of Health and Safety Code section 39666 (d), which gives the district the authority to adopt a rule that is as stringent or more stringent than the ATCM.

We also believe that it is necessary to grant districts the authority to allow emergency standby engines to operate for other specific purposes. In discussions with District representatives, we concluded that emergency standby engines may be required to operate for emission testing purposes to show compliance with existing internal combustion engine rules. It has also come to our attention that several control equipment manufacturers wish to verify their emission reduction claims by emission testing emergency standby stationary engines equipped with their control technologies. Further, newly installed emergency standby engines may be required to operate after initial installation to ensure proper performance of the engine and supported equipment. District Air Pollution Control Officers are best suited to make site specific decisions as to the number of hours an engine should be run for demonstrating compliance with other District rules, Verification testing, or initial start-up testing.

2. Operating requirements and Emission Standards for In-Use Emergency Standby Stationary Diesel-Fueled CI Engines with a rated horsepower greater than 50

General Operating Requirements and Emission Standards

The emission standards and operating requirements for in-use emergency standby diesel-fueled CI engines are summarized in Table V-4.

Table V-4: Diesel PM Standards and Operational Requirements for In-Use Emergency Standby Stationary Diesel-Fueled Engines

Diesel PM Standards (g/bhp-hr)	NMHC/NOx/CO Standards (g/bhp-hr)	Maximum Allowable Annual Hours of Operation for Engines Meeting Diesel PM Limit			Compliance Dates by Model Year of Engine	
		Emergency Use	Non-Emergency Use		Owns 3 or Fewer Engines	Owns 4 or More Engines
			Emission Testing to show compliance[1]	Maint. & Testing (hours/year)		
Not Limited by ATCM[2]	If control strategy is not Verified retrofit technology, show no increase from baseline levels	Not Limited by ATCM[2]	Not Limited by ATCM[2]	20	Pre-89 thru 89 1/1/2006 90 to 96 1/1/2007 96 thru POST- 96 1/1/2008	Pre-89 thru 89 25% 1/1/06 50% 1/1/07 75% 1/1/08 100% 1/1/09 90 to 96 30% 1/1/07 60% 1/1/08 100% 1/1/09 96 thru POST- 96 50% 1/1/08 100% 1/1/09
≤ 0.40		Not Limited by ATCM[2]	Not Limited by ATCM[2]	30		
≤ 0.15		Not Limited by ATCM[2]	Not Limited by ATCM[2]	District Discretion but may not exceed 50		
≤ 0.01		Not Limited by ATCM[2]	Not Limited by ATCM[2]	District Discretion but may not exceed 100		

1. Emission testing limited to testing to show compliance with subsections (e)(2)(A)(ii).
2. May be subject to emission or operational restrictions as defined in current applicable district rules, regulations, or policies.

As with new emergency standby stationary diesel-fueled CI engines, the ATCM establishes diesel PM emission standards that become more stringent as the maximum allowable annual hours for maintenance and testing increase. The owners or operators of in-use stationary diesel-fueled CI engines are required to comply with these emission and operational limits. Engines that operate less than or equal to 20 hours per year for maintenance and testing purposes are not required by the proposed ATCM to meet a diesel PM emission limit. Engines that operate more than 20, but less than or equal to 30 hours per year for maintenance and testing purposes are required to meet a diesel PM emission limit of 0.40 g/bhp-hr. The proposed ATCM is structured to limit maintenance and testing operation at 30 hours per year for most engines, based on staff's belief that the majority of engines do not require more hours to ensure reliability. However, if an owner or operator needs to operate his or her engine more than 30 hours per year for maintenance and testing purposes, the proposed ATCM allows the District to establish the emission standards and operating requirements for that engine on a site-specific basis with the following restrictions. If the owner or operator needs more than 30 hours per year, but less than or equal to 50 hours per year for maintenance and testing purposes, the diesel PM emission rate of that engine may not

exceed 0.15 g/bhp-hr. If the owner or operator needs more than 50 hours per year, but less than or equal to 100 hours per year for maintenance and testing purposes, the diesel PM emission rate of that engine may not exceed 0.01 g/bhp-hr. The criteria to be considered by the District when making this decision include the site-specific potential cancer risk, the NOx emission rate of the engine, the existence of additional diesel-fueled engines operating on-site, and current and planned use of surrounding land.

ARB staff estimates that an engine that meets the requirements of the ATCM as summarized in Table V-4, and operates the typical number of hours for emergency use, will result in a maximum offsite cancer risk that is below district-defined significant risk levels. See Appendix F, Basis for the Standards, for a more detailed discussion on potential offsite cancer risk. For those site-specific situations where the potential risk may warrant further evaluation, such as facilities with multiple engines, the ATCM provides the District with the authority to establish more stringent standards.

The proposed ATCM establishes HC, NOx, or NMHC +NOx, and CO standards for in-use emergency standby stationary diesel-fueled CI engines that use diesel PM control technologies that are not verified through the ARB's Verification Procedure. For technologies that have been verified through ARB's Verification Procedure, these standards are unnecessary because the Verification Procedure requires limits at least as stringent as these be met. For unverified control technologies, the ATCM limits any increase in the emission rate of HC or NOx emissions to less than or equal to 10 percent from baseline levels. The 10 percent increase is allowed to take into account the uncertainty of the test methods. An option to meeting the separate HC and NOx standards is to meet a combined NMHC+NOx limit. The ATCM does not allow any increase in the sum of NMHC and NOx from baseline levels. For CO, the ATCM limits the increase in CO emissions from implementing a non-verified control strategy to less than or equal to 10 percent from baseline levels. The underlying goal of these standards is to not increase the emissions of other criteria pollutants when implementing control strategies that reduce diesel PM emissions.

<u>In-Use Stationary Diesel-Fueled Engines: Compliance Schedule</u>

Schedule for Engines that Meet Requirements with Hour Limitations

Each owner or operator of an in-use emergency standby stationary diesel-fueled engine that can meet the emission standards and operating requirements discussed above by solely maintaining or reducing the current annual hours of operation for maintenance and testing, shall maintain engine usage records to show compliance beginning with the January 1, 2005, to December 1, 2006, period and continuing every year thereafter.

Schedule for Engines that Meet Requirements by Reducing Emission Rates

Each owner or operator of three or less in-use emergency standby stationary diesel-fueled engine must meet the operating requirements and emission standards discussed above in accordance with the following schedule:

- All 1989 model year engines and pre-1989 model year engines must be in compliance by no later than January 1, 2006.

- All 1990 model year and post-1990 model year engines, to pre-1996 model year engines must be in compliance by no later than January 1, 2007.

- All 1996 model year engines and post-1996 model year engines must be in compliance by no later than January 1, 2008.

Each owner or operator of four or more in-use emergency standby stationary diesel-fueled engine engines is afforded more time to come into compliance with the above requirements.

1989 and Pre-1989 Model Year Engines

Percent of Engines	Compliance date
25%	January 1, 2006
50%	January 1, 2007
75%	January 1, 2008
100%	January 1, 2009

1990, Post-1990 through Pre-1996 Model Year Engines

Percent of Engines	Compliance date
30%	January 1, 2007
60%	January 1, 2008
100%	January 1, 2009

1996 and Post-1996 Model Year Engines

Percent of Engines	Compliance date
50%	January 1, 2008
100%	January 1, 2009

Prior to the earliest applicable compliance date, the owner operator must provide the District APCO with emissions data for the purposes of demonstrating compliance. The types of emissions data that are acceptable for showing compliance are discussed in more detail in section I.

Interruptible Service Contracts

As with new emergency standby stationary diesel-fueled engines, a new engine used to provide power in a "non-emergency" situation, e.g., the fulfillment of an ISC contract, is classified as a new prime engine, not an emergency standby engine, and is subject to the new prime engine emission standards discussed in subchapters G(3) and G(4). This approach is currently being reevaluated by ARB staff. Modifications to this approach may be presented at the November 13-14, 2003, Board hearing.

District's Authority to Establish More Stringent Standards and Allow Additional Hours of Operation

As with new emergency standby stationary diesel-fueled CI engines, the ATCM grant's the district Air Pollution Control Officer (APCO) the authority to establish more stringent emission standards and operating requirements, and to allow additional hours of operation for demonstrating compliance with other District rules, Verification testing, and initial start-up testing.

3. Operating Requirements and Emission Standards for New Prime Stationary Diesel-Fueled CI Engines with a Rated Horsepower Greater Than 50

General Operating Requirements and Emission Standards

The emission standards for new prime stationary diesel-fueled CI engines are summarized in Table V-5.

Table V-5: Diesel PM Standards and Operational Requirements for New Prime Stationary Diesel-Fueled Engines

DIESEL PM Standards (g/bhp-hr)	NMHC/NOx/CO Standards (g/bhp-hr)	Maximum Allowable Annual Hours of Operation for Engines Meeting Diesel PM Standard	Compliance Dates
≤0.01[1]	Off-road Standard (Appropriate or Tier 1)	Not Limited by ATCM[2]	January 1, 2005

1. Or off-road certification standard (title 13 CCR section 2423) for an off-road engine with the same horsepower rating, whichever is more stringent
2. May be subject to emission or operational restrictions as defined in current applicable district rules, regulations, or policies.

The proposed ATCM establishes requirements for both the sellers and owners of new prime stationary diesel-fueled CI engines. These requirements go into effect January 1, 2005. The proposed ATCM requires all new prime stationary diesel-fueled CI engines to emit diesel PM at a rate of 0.01 g/bhp-hr or less, or meet the current applicable off-road certification standard for an off-road engine of the same horsepower rating.

As with new emergency standby stationary engines, the ATCM also requires all new prime stationary diesel-fueled CI engines to meet the appropriate off-road standards for HC, NOx, or NMHC+NOx, and CO, as defined in Title 13 CCR section 2423. If the engine pre-dates the off-road standards, for example a 1987 model year engine, the

appropriate standard would default to the Tier I standard for the horsepower rating category of the engine.

More Stringent Standards for New Prime Stationary Diesel-Fueled Engines that Produce Electricity Near the Place of Use (Distributed Generation) Currently Eliminate Diesel-Fueled Engines as an Option for Prime Power Generation

Senate Bill 1298 (SB 1298), which was chaptered in September 2000, required the ARB to adopt emission standards and establish a certification program for electrical generation technologies that are exempt from air pollution control or air quality management district permit requirements. SB 1298 focused on electrical generation that is near the place of use and defined these sources as "distributed generation". The ARB also developed guidance to the air districts on the permitting or certification of electrical generation technologies that are subject to district permit.

As a result, new prime stationary diesel-fueled CI engines that are "well controlled" and are used as distributed generations sources will not meet the emission standards defined in the certification regulation. However, these "well-controlled" engines may meet District permitting program requirements, which are less stringent, if those programs are based on the ARB's Guidance for the Permitting of Electrical Generation Technologies. A "well-controlled" new diesel-fueled engine would be the equivalent of a Tier 3 off-road certified engine with an 85 percent reduction in diesel PM emissions (based on the installation of a diesel particulate filter (DPF)) and a 95 percent reduction in NOx emissions (based on the installation of a selective catalyst reduction (SCR) system). The resultant diesel PM and NOx emission levels of a well-controlled diesel-fueled CI engine are estimated at ranging from 0.02 g/bhp-hr (0.06 lb/MW-hr) to 0.03 g/bhp-hr (0.09 lb./MW-hr) for diesel PM and from 0.14 g/bhp-hr (0.41 lb/MW-hr) to 0.23 g/bhp-hr (0.67 lb./MW-hr) for NOx. Although these reductions are theoretically possible, installing both control technologies on one engine may result in less than optimum reduction in diesel PM. Factors that could reduce the reduction efficiency of a DPF that is installed in back of an SCR in the exhaust stream of a diesel-fueled engine include reduced inlet temperature and reductant slip.

The following paragraphs summarize the requirements of both the certification regulation and the guidance.

DG Certification Regulation Requirements

- Distributed generation sources must be certified by the ARB before they can be sold in California *if they are exempt from district permit requirements.*
- The DG Certification emission standards for 2003 and 2007 are summarized below.

Table V-6: January 1, 2003 Emission Standards

Pollutant	DG Unit not Integrated with Combined Heat and Power	DG Unit Integrated with Combined Heat and Power
NOx	0.5 lb/MW-hr (0.17 g/bhp-hr)	0.7 lb/MW-hr (0.24 g/bhp-hr)
CO	6.0 lb/MW-hr (2.0 g/bhp-hr)	6.0 lb/MW-hr (2.0 g/bhp-hr)
VOCs	1.0 lb/MW-hr (.34 g/bhp-hr)	1.0 lb/MW-hr (0.34 g/bhp-hr)
PM	An emission limit corresponding to natural gas with fuel sulfur content no more than 1 grain/100scf	An emission limit corresponding to natural gas with fuel sulfur content no more than 1 grain/100scf

Table V-7: January 1, 2007 Emission Standards

Pollutant	All DG Units
NOx	0.07 lb/MW-hr (.02 g/bhp-hr)
CO	0.10 lb/MW-hr (.03 g/bhp-hr)
VOCs	0.02 lb/MW-hr (.007 g/bhp-hr)
PM	An emission limit corresponding to natural gas with fuel sulfur content no more than 1 grain/100scf

The above standards are not currently achievable by diesel-fueled CI engine technology.

DG Guidance Document

The ARB developed guidance for electrical generation technologies *that are subject* to district permits. These technologies included reciprocating engines. The purpose of the guidance is to assist the air districts in making permitting decisions for electrical generation technologies that are subject to district permits. The guidance includes recommended Best Available Control Technology (BACT) levels and suggested permit conditions

Table V-8 summarizes the BACT recommendations for Reciprocating Engines used in Distributed Generation Applications.

Table V-8: Summary of BACT for the Control of Emissions from Reciprocating Engines Used in Electrical Generation

Equipment Category	NOx lb/MW-hr	VOC lb/MW-hr	CO lb/MW-hr	PM lb/MW-hr
Fossil fuel fired	0.5 (0.15 g/bhp-hr or 9 ppmvd*)	0.5 (0.15 g/bhp-hr or 25 ppmvd*)	1.9 (0.6 g/bhp-hr or 56 ppmvd*)	0.06 (0.02 g/bhp-hr)

* lb/MW-hr standard is equivalent to g/bhp-hr and ppmvd expressed at 15 percent O_2. Concentration (ppmvd) values are approximate.

4. Operating Requirements and Emission Standards for In-Use Prime Stationary Diesel-Fueled CI Engines with a rated horsepower greater than 50

General Operating Requirements and Emission Standards

The emission standards for in-use prime stationary diesel-fueled CI engines are summarized in Table V-9.

Table V-9: Diesel PM Standards and Operational Requirements for In-Use Prime Stationary Diesel-Fueled Engines

Diesel PM Standards (g/bhp-hr)		NMHC/NOx/CO Standards (g/bhp-hr)	Maximum Allowable Annual Hours of Operation for Engines Meeting Diesel PM Standard	Compliance Dates by Model Year of Engine	
Applicability	**Limit**			**Owns 3 or Fewer Engines**	**Owns 4 or More Engines**
All Engines	85% reduction from baseline levels (Option 1) or 0.01 g/bhp-hr [1] (Option 2)	If control strategy is not Verified retrofit technology, show no increase from baseline levels	Not Limited by ATCM[2]	Pre-89 thru 89 1/1/2006 90 to 96 1/1/2007 96 thru POST- 96 1/1/2008	Pre-89 thru 89 25% 1/1/06 50% 1/1/07 75% 1/1/08 100% 1/1/09 90 to 96 30% 1/1/07 60% 1/1/08 100% 1/1/09 96 thru POST- 96 50% 1/1/08 100% 1/1/09
Uncertified Engines	30% from baseline and meet 0.01 g/bhp-hr by July 1, 2011 (Option 3)			All Model Years - 30% reduction from baseline levels by January 1, 2006 - Meet 0.01 g/bhp-hr by July 1, 2011	

1. Or off-road certification standard (title 13 CCR section 2423) for an off-road engine with the same horsepower rating, whichever is more stringent
2. May be subject to emission or operational restrictions as defined in current applicable district rules, regulations, or policies.

The proposed ATCM requires each in-use prime stationary diesel-fueled CI engine that is NOT certified to the Off-Road Compression Ignition Engine Standards (Title 13, CCR section 2423) to either

Option 1) reduce its diesel PM emission rate by 85 percent from baseline levels; or

Option 2) emit diesel PM at a rate of 0.01 g/bhp-hr or less, or meet the current applicable off-road certification standard for off-road engines of the same horsepower, whichever is more stringent; or

Option 3) reduce its diesel PM emission rate by at least 30 percent from baseline levels, by no later than January 1, 2006, and emit diesel PM at a rate of 0.01 g/bhp-hr or less by no later than July 1, 2011.

In-use prime stationary diesel-fueled CI engines that are certified to the Off-Road Compression Ignition Engine Standards must comply with either Option 1 or Option 2, above.

Baseline level is defined as the emission level of a diesel-fueled CI engine using CARB diesel fuel as configured upon initial installation or by January 1, 2003, whichever is later. The purpose of setting the baseline as some point in the past as opposed to the effective date of the ATCM, was to avoid providing a disincentive to an owner from reducing diesel PM emissions well prior to the compliance date for the engine. Additional guidance that owners or operators can use when defining the baseline diesel PM emission levels can be found in Appendix I, Determination of Baseline Levels.

As with new emergency standby stationary diesel-fueled CI engines, the ATCM establishes HC, NOx, or NMHC +NOx, and CO standards for in-use emergency standby stationary diesel-fueled CI engines that use diesel PM control technologies that are not verified through the ARB's Verification Procedure. For unverified control technologies, the ATCM limits any increase in the emission rate of HC or NOx emissions to less than or equal to 10 percent from baseline levels. An option to meeting the separate HC and NOx standards is to meet a combined NMHC+NOx limit. The ATCM does not allow any increase in the sum of NMHC and NOx from baseline levels. For CO, the ATCM limits the increase in CO emissions from implementing a non-verified control strategy to less than or equal to 10 percent from baseline levels. The underlying goal of these standards is to not increase the emissions of other criteria pollutants when implementing control strategies that reduce diesel PM emissions.

Schedule for Engines that Meet Requirements by Complying with Option 1 or Option 2

Each owner or operator of three or less in-use emergency standby stationary diesel-fueled engine must meet the operating requirements and emission standards discussed above in accordance with the following schedule

- All 1989 model year engines and pre-1989 model year engines must be in compliance by no later than January 1, 2006.
- All 1990 model year and post-1990 model year engines, to pre-1996 model year engines must be in compliance by no later than January 1, 2007.
- All 1996 model year engines and post-1996 model year engines must be in compliance by no later than January 1, 2008.

Each owner or operator of four or more in-use emergency standby stationary diesel-fueled engine engines is afforded more time to come into compliance with the above requirements.

1989 and Pre-1989 Model Year Engines

Percent of Engines	Compliance date
25%	January 1, 2006
50%	January 1, 2007
75%	January 1, 2008
100%	January 1, 2009

1990, Post-1990 through Pre-1996 Model Year Engines

Percent of Engines	Compliance date
30%	January 1, 2007
60%	January 1, 2008
100%	January 1, 2009

1996 and Post-1996 Model Year Engines

Percent of Engines	Compliance date
50%	January 1, 2008
100%	January 1, 2009

Prior to the earliest applicable compliance date for Option 1, 2, or 3, the owner operator must provide the District APCO with emissions data for the purposes of demonstrating compliance. The types of emissions data that are acceptable for showing compliance are discussed in more detail in subsection I.

District's Authority to Establish More Stringent Standards and Allow Additional Hours of Operation

As with new emergency standby stationary diesel-fueled CI engines, the ATCM grant's the district Air Pollution Control Officer (APCO) the authority to establish more stringent emission standards and operating requirements, and to allow additional hours of operation for demonstrating compliance with other District rules, Verification testing, and initial start-up testing.

5. Operating Requirements and Emission Standards for New Stationary Diesel-Fueled CI Engines Used in Agricultural Operations with a rated horsepower greater than 50

General Operating Requirements and Emission Standards

The emission standards and operational requirements for new stationary diesel-fueled CI engines used in agricultural operations (new agricultural engines) are summarized in Table V-10.

Table V-10: Diesel PM Standards and Operational Requirements for New Agricultural Engines

Diesel PM Standards (g/bhp-hr)	NMHC/NOx/CO Standards (g/bhp-hr)	Maximum Allowable Annual Hours of Operation for Engines Meeting Diesel PM Limit	Compliance Dates
≤0.15[1]	Off-road Standard	Not Limited by ATCM[2]	January 1, 2005

1. Or off-road certification standard (title 13 CCR section 2423) for an off-road engine with the same horsepower rating, whichever is more stringent
2. May be subject to emission or operational restrictions as defined in current applicable district rules, regulations, or policies.

The proposed ATCM establishes requirements for both the sellers and owners of new stationary diesel-fueled CI engines used in agricultural operations. These requirements go into effect January 1, 2005. The proposed ATCM requires all new agricultural engines to emit diesel PM at a rate of 0.15 g/bhp-hr or less, or meet the current applicable off-road certification standard for an off-road engine of the same horsepower rating. Both prime and emergency standby must meet the same emission limit. Emergency standby engines used in agricultural operations are not limited in their hours of operation.

As with new non-agricultural stationary diesel-fueled stationary CI engines, the ATCM requires new agricultural engines to meet the appropriate model year HC, NOx (or NMHC + NOx) and CO Off-Road Compression Ignition Engine Standards, as defined in Title 13 CCR section 2423. If the engine pre-dates the off-road certification standards, for example a 200hp engine manufactured in 1995, the agricultural engine would not be required to meet a HC, NOx (or NMHC+NOx) or CO emission limit.

Basis for Separate Standards

The proposed ATCM establishes separate emission standards for new agricultural engines. See section D, Exemptions, for a detailed discussion on why these separate emission standards were established.

Carl Moyer/EQIP Engines

The Carl Moyer Memorial Air Quality Standards Attainment Program provides funds on an incentive-basis for the incremental cost of cleaner than required engines and equipment. Eligible projects include cleaner on-road, off-road, marine, locomotive and stationary agricultural pump engines, as well as forklifts, airport ground support equipment, and auxiliary power units. The program's primary goal is to achieve near-term reductions in emissions of oxides of nitrogen (NOx), which are necessary for California to meet its clean air commitments under the State Implementation Plan. In

addition, local air districts use these NOx emission reductions to meet commitments in their conformity plans, thus preventing the loss of federal funding for local areas throughout California. A secondary goal of the program is the reduction of particulate matter (PM) emissions. Many of the stationary agricultural pump engines that were replaced as part of the Carl Moyer Program, were replaced with engines that significantly reduced both NOx and diesel PM emissions.

The Environmental Quality Incentives Program (EQIP) was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land. The program provides funds for the purchase of low-emitting diesel-fueled engines.

Prior to January 1, 2008, the ATCM allows new agricultural engines that were purchased with Carl Moyer and EQIP funds to be exempt from the emission standards discussed in this section as long as they meet Tier II Off-Road Compression Ignition Standards for the horsepower category of the engine. The Tier II standards are found in Title 13, CCR section 2423).

6. Emission Standards for New Stationary Diesel-Fueled CI Engines with a rated horsepower less than or equal to 50

General Emission Standards

The emission standards for new stationary diesel-fueled CI engines with a rated horsepower less than or equal to 50 are summarized in Table V-11.

Table V-11: Diesel PM Standards and Operational Requirements for New Stationary Diesel-Fueled Engines ≤ 50 HP

Diesel PM Standards (g/bhp-hr)	NMHC/NOx/CO Standards (g/bhp-hr)	Maximum Allowable Annual Hours of Operation for Engines Meeting Diesel PM Limit	Compliance Dates
Off-road Standard	Off-road Standard	Not Limited by ATCM [1]	January 1, 2005

1. May be subject to emission or operational restrictions as defined in current applicable district rules, regulations, or policies.

The proposed ATCM establishes requirements for sellers of new stationary diesel-fueled CI engines with a rated horsepower less than or equal to 50. These requirements go into effect January 1, 2005. The proposed ATCM requires all new stationary diesel-fueled CI engines with a rated horsepower less than or equal to 50

meet the current applicable off-road certification standard for an off-road engine of the same horsepower rating.

H. Reporting, Notification, Recordkeeping, and Monitoring Requirements

1. Reporting Requirements

The purpose of the reporting requirements are to establish an accurate inventory of stationary CI engines currently operating in California. The information that is required to be reported will be used by both District and ARB staff. Initially, owners or operators of stationary CI engines will be required to report information on their current inventory of engines. Those that are required to meet emission standards will be required to submit information to the district on how they plan on complying with the ATCMs requirements. Owners and operators of either engines that are less than or equal to 50 hp or agricultural engines will not be required to report any information, but those that sell these engines to end-users will be required to report to the ARB, the number of each make and model engine they sell for stationary applications. An "end-user" is defined as any person who purchases or leases a stationary diesel-fueled engine for operation in California. Persons purchasing engines for resale are not considered end-users. The following paragraphs discuss the reporting requirements in more detail.

Initial Reporting Requirements for Owners and Operators of Stationary CI Engines > 50 hp that are not used in Agricultural Operations

Table V-12 identifies the initial information that is required to be submitted to the District APCO by no later than January 1, 2005, by owners or operators of in-use stationary CI engines, and prior to the engine installation date by owners or operators of new stationary CI engines. The District APCO may exempt the owner or operator from providing all or part of the information identified in Table V-6 if the information is available in the owner or operators permit to operate. With the information provided, District staff will be able to develop a detailed inventory of engines subject to the requirements of the ATCM. The information will also be useful in updating the ARB's stationary engine inventory and emissions inventory, and for implementing the requirements AB 2588 (see Chapter X, Additional Considerations for a discussion of AB 2588 requirements). ARB staff will develop a standard spreadsheet format in Microsoft Word that will be made available to the public via our web site, http://www.arb.ca.gov. We request that submittals be made using the spreadsheet.

Table V-12: Reporting Information – Stationary CI Engines Currently Operating in California

Owner/Operator Contact Information	(EXAMPLE RESPONSES)
Company Name	ABCD, Inc.
Contact Name, Phone number, address, and e-mail address	Joe Smith 999 High Desert Bluff Road, Mojave, CA 90089 www.jsmith.com
Address of engine	Same as above
Engine Information	
Make	Acme
Model	3006 D
Serial Number	Abcd1234567
Year of manufacture (if unable to determine, approximate age)	Bought brand new in 1987
Rated Brake Horsepower	330 bhp @ 2200 rpm
Exhaust stack height from ground	10 feet
Engine Emission Factor and Supporting Data (if available)	
PM	.25 g/bhp-hr (manuf. Test data)
NOx	0.40 g/bhp-hr
HC	0.25 g/bhp-hr
NMHC+NOx	N/A
CO	0.25 g/bhp-hr
Control Equipment	
Turbo	X
Aftercooler	X
Injection Timing Retard	
Catalyst	
Diesel Particulate Filter	
Other	
Fuel Used	
CARB Diesel	
Jet Fuel	
Diesel	
Alternative Diesel Fuel	Biodiesel 50
Alternative Fuel	
Combination (dual fuel)	
Other	
Operation Information	
Describe General Use of Engine	Stationary crane for loading trucks
Typical Load (% of bhp rating)	80% load
Typical annual hours of operation	200
If seasonal, months of year operated and typical hours per month operated	N/A
Fuel Usage Rate (if available)	7 gallons/hour
Distance to nearest offsite receptor	14 miles (residence)
Is engine included in an existing AB 2588 emission inventory?	No

Control Strategy Reporting Requirements for Owners or Operators of In-Use Stationary CI Engines > 50 hp that are not used in Agricultural Operations

No later than 180 days prior to the earliest applicable compliance date (see subchapter I for information on compliance dates), each owner or operator of an in-use stationary diesel-fueled CI engine shall provide the District with information identifying the control strategy for complying with the requirements of the ATCM. Examples of compliance strategies include 1) reducing hours used for maintenance and testing, 2) reducing diesel PM emissions by 85 percent through the implementation of a diesel particulate filter, and 3) removing an engine from service and replacing it with a new diesel-fueled CI engine that meets the ATCM requirements.

Sales Reporting Requirements for New Diesel-Fueled CI Engines > 50 hp Used in Agricultural Operations

Any person who sells a stationary diesel-fueled CI engine > 50 hp to another person who will operate it in California in an agricultural operation shall provide the information identified in Table V-13 to the Executive Officer of the Air Resources Board.

The sales reports will be due on the first of the year and will cover all sales during the previous calendar year. The first report is due January 1, 2006, and will cover all sales from January 1, 2005, to December 31, 2005.

Table V-13: Reporting Information for Sellers of Stationary Agricultural Engines > 50 HP, and All Engines ≤ 50 HP

Seller Contact Information				**(Example Responses)**			
Company Name				ACME, Inc.			
Contact Name, Phone Number, Address, and E-Mail Address				Joe Smith 999 Stony Road, Truckee, CA 90089 www.jsmith.com			
Engine Sales Information							
Make	**Model**	**Model Year**	**Rated Brake Horsepower**	**Executive Order Number for Off-Road Certification**	**Engine Family Number**	**Emission Control Strategy**	**Number Sold**
CAT	1234	2005	300 bhp @ 1800 rpm	1232456	897654	DPF	14
DDC	N/A	N/A (~1994)	N/A	N/A	N/A	DPF	1

Sales Reporting Requirements for New Diesel-Fueled CI Engines < 50 hp

Any person who sells a stationary diesel-fueled CI engine ≤ 50 hp to another person who will operate it in California shall provide the information identified in Table V-12 to the Executive Officer of the Air Resources Board.

The sales reports will be due on the first of the year and will cover all sales during the previous calendar year. The first report is due January 1, 2006, and will cover all sales from January 1, 2005, to December 31, 2005.

2. Notification Requirements

Notification of Non-Compliance

Owners or operators that determine they are operating their stationary diesel-fueled CI engines in violation of the operating requirements or emission standards of the ATCM shall notify the district APCO upon detection and be subject to district enforcement action or variance provisions. Examples of non-compliance scenarios that should be detected by owners or operators include exceeding limits on annual hours for maintenance and testing operation, exceedance of emission limitation as determined through visual inspection (i.e., black smoke out of tail pipe.)

Notification of Loss of Exemption

Owners or operators of in-use stationary diesel-fueled CI engines that violate the conditions of their exemption (e.g., minimum distance to receptor requirements, annual hours of operation requirements) shall notify the district APCO of the exceedance upon detection. The engines shall then be brought into compliance with the appropriate emission standards and operating requirements of the ATCM by no later than 180 days after notification. The owners and operators of these engines shall provide the District APCO with emissions data showing compliance, as necessary. The types of emissions data that are acceptable for showing compliance are discussed in more detail in subchapter I.

Owners or operators of in-use stationary diesel-fueled CI engines exempt from the operating requirements or emission standards of the ATCM in accordance with Exemptions listed in subchapter D, shall be notified by the District APCO if the exemption no longer applies. No later than 180 days (may change to 18 months) after notification, the previously exempt engine must come into compliance with the appropriate emission standards and operating requirements and provide the District APCO with emissions data showing compliance, as necessary. The types of emissions data that are acceptable for showing compliance are discussed in more detail in subchapter I.

Monitoring Equipment and Recordkeeping Requirements

A non-resettable hour meter must be installed on all stationary diesel-fueled CI engines subject to operating requirements or emission limitations. For emergency standby engines, and those engines that have hours of operation limitations based on exemption criteria, the hour meters serve tool for District's to use when enforcing the requirements of the ATCM. However, because hour meters cannot determine between hours used for an emergency and hours used for maintenance and testing, the ATCM

also requires records to be kept documenting the reason for operation of these engines. An owner or operator of an emergency standby engine or one subject to an exemption that limits hours of operation, must keep records of the number of hours the engines are operated on a monthly basis. Such records must be retained on-site for a minimum of 36 months from date of entry. Record entries must be retained on-site, either at a central location or at the engine location, and made immediately available to the District staff upon request. Record entries made 36 months from the most recent entry shall be made available to the District staff five working days from request. The monthly record log shall contain the following information:

- emergency use hours of operation
- maintenance and testing hours of operation, including ISC hours as appropriate
- hours of operation for emission testing to show compliance with the emission standards of the ATCM
- initial start-up hours
- other use hours.

A backpressure monitor must be installed on all engines that have a diesel particulate filter. The purpose of the backpressure monitor is to notify the owner or operator when the high backpressure limit of the engine is approached.

The district has the authority to require additional monitoring equipment dependant on the control strategy used to meet the emission standards of the ATCM.

I. Emissions Data

This section identifies describes the types of information that can be submitted to the district APCO to show compliance with the emission standards of the ATCM. This information includes engine manufacturer's data, emission test data from similar engines, emission test data used in meeting the requirements of the Verification Procedure, certification data, and source test information from the engine subject to the requirements. ARB staff does not anticipate that a majority of the engines subject to the proposed ATCM will be required to be source tested. ARB staff believes that most owners of emergency standby diesel-fueled CI engines subject to the requirements of the proposed ATCM will reduce their hours of operation for maintenance and testing operations to below 20 hours per year. This is the most cost-effective method of compliance. For prime engines, and those emergency standby engines that are unable to reduce their hours of operation to below 20 hours per year, engine certification test data for post –1996 engines and manufacturers test data for post-1988 engines is available for many in-use engines.

Engine Manufacturer's Data

Many engine manufacturer's have historical emissions test data for 1988 model year engines and newer. For in-use stationary prime diesel-fueled CI engines, this data

could be used to establish baseline emission levels. The owner or operator of the engine would submit the data to the District for review. The District would evaluate the engine manufacturer's data and determine how applicable it is to the baseline configuration of the engine. The type of information that should be submitted to the district when using engine manufacturer's emissions data to show compliance with the ATCM includes the following:

- Engine Make
- Engine Model Number
- Engine Serial Number
- Engine Family Number
- Year of Manufacture
- Engine Emission Rates
  - Test Method
  - Modal data
    a. PM
    b. NOx
    c. HC
    d. NMHC+NOx
    e. CO
- Weighted Average Value for Test for each pollutant

Verification Procedure

The Verification Procedure (Procedure) can be found on the ARB's web site at http://www.arb.ca.gov/regact/dieselrv/dieselrv.htm. The purpose of the procedure is to verify the emission reduction capability of technologies that can be used to reduce the emissions of diesel PM and NOx from diesel-fueled engines. The procedure requires the control technology manufacturers to identify the targeted emission control group. The term "Emission control group" means a set of diesel engines and applications determined by parameters that affect the performance of a particular control technology. Parameters can include engine cycle, engine size, operating load, fuel used, etc. The Procedure requires emission testing be performed in accordance with requirements defined in the Procedure. The emission testing results are from both baseline testing and post-control-technology-installation testing. To the extent that the emission control group includes an engine that is subject to the emission standards of this ATCM, the emissions test data that is used to support Verification can be used to support compliance with the ATCM.

Certification Data

Since 1996, diesel-fueled CI engines that are used in off road applications have been required to be certified in accordance with the ARB off-road regulations, California Code of Regulations, Title 13, section 2423. Similarly, U.S. EPA has required nonroad (which is equivalent to off-road) diesel-fueled CI engines to be certified in accordance with U.S. EPA nonroad regulations, Code of Federal Regulations, Title 40, Part 89. The goal of the California certification program was to harmonize with the federal certification

program as much as possible. The test cycles identified in each of the programs are identified by different "names", but are otherwise identical. When certifying an off-road engine, the applicant identifies and tests an engine that is representative of a specific engine family. The certification results apply to all engines within that family. The emission tests are completed in accordance with the steady state cycles outlined in both certification programs. These test cycles are consistent with the test cycles that are identified in the ATCM as defined in ISO-8178 Part 4, and discussed in subchapter K, Test Methods. Upon District approval, and to the extent the certification test engine is similar in configuration to the engine seeking compliance with this ATCM, the certification test data can be used as baseline emission test data.

Source Test

To show compliance with the emission standards identified in the ATCM, the owner or operator always has the option of testing the engine. Subchapter J, Test Methods, provides information on the recommended test methods for showing compliance with the emission standards identified in the ATCM.

J. Test Methods

The proposed ATCM establishes emission standards for stationary diesel-fueled CI engines in the form of emission rate limits and percent reductions from baseline emission levels. In most cases, existing emission rate data from engine manufacturer testing, off-road engine certification, and control equipment verification can be used to show compliance with these emission standards. For those cases where no applicable emissions rate data exists, emission testing of the engine may be necessary. ARB staff has identified the following emission test methods as those that should be used to show compliance with the proposed ATCM. Alternatives to these test methods may be used upon approval of the District APCO.

Diesel PM

Diesel PM emission testing shall be done in accordance with one of the following three methods. See Appendix G, Test Method Workgroup, for a more detailed discussion of these methods:

- CARB Method 5 (front half, only, and in accordance with ISO 8178-4 cycles)
- International Standards Organization (ISO) 8178-1:1996(E); ISO 8178-2: 1996(E); and ISO 8178-4 1996(E).
- California Code of Regulations, Title 13, Section 2423, Exhaust Emission Standards and Test Procedures – Off-Road Compression Ignition Engines.

NOx, CO, and HC

Nitrogen Oxides, Carbon Monoxide, and Hydrocarbon emission testing shall be done in accordance with one of the following three methods:

- CARB Method 100 (in accordance with ISO 8178-4 cycles)
- International Standards Organization (ISO) 8178-1:1996(E); ISO 8178-2: 1996(E); and ISO 8178-4 1996(E).
- California Code of Regulations, Title 13, Section 2423, Exhaust Emission Standards and Test Procedures – Off-Road Compression Ignition Engines.

NMHC

Non-Methane Hydrocarbon emission testing shall be done in accordance with one of the following two methods:

- International Standards Organization (ISO) 8178-1:1996(E); ISO 8178-2: 1996(E); and ISO 8178-4 1996(E).
- California Code of Regulations, Title 13, Section 2423, Exhaust Emission Standards and Test Procedures – Off-Road Compression Ignition Engines

REFERENCES:

Fairbanks Morse. *Memo from Tony Biondi to Hans Huber: Exhaust emitted particulate matter measured from a 16-251F Alco engine*; February 16, 2000. (Fairbanks Morse, 2000)

Pacific Gas and Electric Company. *Letter responding to ARB's request for information on diesel-fueled engines at Diablo Canyon Power Plant*; August 6, 2002. (PG&E, 2002)

San Diego County Air Pollution Control Districts. *Facsimile from San Diego County APCD: Permit to Operate, Diesel-fueled Emergency Standby Engines operated by Southern California Edison at HY 101 Nuclear Gen Station, San Onofre, CA, Permit Number 960632*; June 18, 2003. (SDCAPCD, 2003)

California Air Resources Board. *Meeting with representatives from Diablo Canyon Nuclear Power Plant, San Onofre Nuclear Generating Station, San Diego County Air Pollution Control District, and San Luis Obispo County Air Pollution Control District*; September 11, 2002. (ARB, 2002)

California Air Resources Board. *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles*; October 2000. (ARB, 2000)

VI. TECHNOLOGICAL FEASIBILITY OF THE PROPOSED ATCM

There are a variety of technologies available to reduce diesel PM emissions from stationary diesel-fueled engines. Since the 1970's, much of the diesel emission control has been achieved through emission-conscious engine design. For example, emission improvements include modifications in combustion chamber geometry, increased fuel injection pressure, and design for better fuel atomization and mixing with the air. (DieselNet, 1998) In the past 15 years, more development effort has been put into catalytic exhaust emission control devices for diesel engines, particularly in the areas of particulate matter control. Those developments make the widespread commercial use of diesel exhaust emission controls feasible. (ARB, 2003a)

In this chapter of the staff report, we provide descriptions of PM reduction emission control strategies currently available and projected to be available in the near future. We focus on those we believe will be employed to comply with the proposed ATCM. Additional information on the wide variety of emission reduction options for diesel fueled engines is provided in the Diesel Risk Reduction Plan. (ARB, 2000) We also describe actual in-use experience with diesel PM emission control systems (DECS) or clean fuels that stationary engine operators are currently using and the results from a demonstration program undertaken by the ARB to further evaluate the applicability of various DECS to stationary diesel-fueled engines.

A. New Engine Standards

Many advancements have been made in combustion technology and engine design that have significantly reduced the emissions from new diesel engines. Diesel engines today emit over 80 percent less PM and over 60 percent less NOx than they did in 1988. (Diesel, 2003) Beginning in 1996, manufacturers of diesel engines have been subject to U.S. EPA's nonroad diesel emission regulation (40 CFR Part 89). The nonroad diesel emission standards are tiered (i.e., Tier 1, 2, 3, 4), and the date upon which each tier takes effect depends on the engine size. As of January 1, 2000, all engine sizes were subject to Tier 1 standards. In 2006, all engines sizes will be subject to Tier 2, and in 2008, all engines sizes will be subject to Tier 3 standards. These standards, which become increasingly more stringent over time, will result in the development of new lower emitting diesel engines in the future years. More recently, in May 2003, U.S. EPA proposed new Tier 4 emission standards which will require most engines to meet a 0.01 g/bhp-hr emission rate in the 2011-2014 timeframe. The proposed Tier 4 standards, if adopted, will result in ultra-clean diesel engines that will be over 90 percent cleaner than 1988 vintage engines.

B. Diesel PM Exhaust Aftertreatment Emission Controls

There are various advanced exhaust aftertreatment technologies commercially available that can provide significant reductions in diesel PM particularly when combined with low sulfur diesel fuel. The principal technologies that have been successfully used to reduce diesel PM from stationary diesel-fueled engines are diesel particulate filters

(DPFs) and diesel oxidation catalysts (DOCs). Flow through filters, sometimes referred to as enhanced DOCs, are relatively new to the market but also show promise in reducing diesel PM from diesel-fueled engines. These are each briefly described below.

Diesel Particulate Filters

DPFs have been successfully used in many applications, including prime stationary and emergency standby engines. In general, a DPF consists of a porous substrate that permits gases in the exhaust to pass through but traps the diesel PM. Diesel PM emission reductions in excess of 85 percent are possible, depending on the associated engine's baseline emissions, fuel sulfur content, and emission test method or duty cycle. In addition, up to a 90 percent reduction in CO and a 95 percent reduction in HC can also be realized with DPFs. (Allansson, 2000) Most DPFs employ some means to periodically regenerate the filter, i.e., burn off the accumulated PM. In California, diesel-fueled school buses, emergency backup generators, solid waste collection vehicles, urban transit buses, medium-duty delivery vehicles, people movers, and fuel tankers trucks have been retrofitted with DPFs through various voluntary and regulatory mandated programs as well as demonstrations programs. Particulate filters can be either active or passive systems.

Active DPFs use a source of energy beyond the heat in the exhaust stream itself to help regeneration. Active DPF systems can be regenerated electrically, with fuel burners, with microwaves, or with the aid of additional fuel injection to increase exhaust gas temperature. Some active DPFs induce regeneration automatically onboard the vehicle or equipment when a specified back pressure is reached. Others simply indicate when to start the regeneration process. Some active systems collect and store diesel PM over the coarse of a full day or shift and are regenerated at the end of the day of shift with the vehicle or equipment shut off. A number of the smaller filters are removed and regenerated externally at a "regeneration station." Because they have control over their regeneration and are not dependent on the heat carried in the exhaust, active DPFs have a much broader range of application and a much lower probability of getting plugged than passive DPFs.

A passive DPF is one in which a catalytic material, typically a platinum group metal, is applied to the substrate. The catalyst lowers the temperature at which trapped PM will oxidize to temperatures periodically reached in diesel exhaust. No additional source of energy is required for regeneration, hence the term "passive."

Field experience has indicated that the success or failure of a passive DPF is primarily determined by the average exhaust temperature at the filter's inlet and the rate of PM generated by the engine. These two quantities, however, are determined by a host of factors pertaining to both the details of the application and the state and type of engine being employed. As a result, the technical information that is readily accessible can sometimes serve as a guide, but it may be insufficient to determine whether a passive DPF will be successful in a given application. (ARB, 2002)

With regard to estimating average exhaust temperature in actual use, commonly documented engine characteristics such as the exhaust temperature at peak power and peak torque are insufficient. The exhaust temperature at the DPF's inlet is highly application dependent in that the particular duty cycle experienced plays a prominent role, as do heat losses in the exhaust system. Very application-specific characteristics enter the heat loss equation, such as the length of piping the exhaust must travel through before it reaches the DPF. Lower average exhaust temperatures can also be the result of operations of engines oversized for the application or engines run without a load applied. (ARB, 2002)

Diesel Oxidation Catalysts

Diesel oxidation catalysts (DOCs) are the most common currently used form of diesel aftertreatment technology and have been used for compliance with the PM standards for some on-highway engines since the early 1990s. DOCs are generally referred to as "catalytic converters." DOCs are devices attached to the engine exhaust system. They have chemicals lining them which catalyze the oxidation of carbonaceous pollutants – some of the soot emissions and a significant portion of the soluble organic fraction. These carbon-containing pollutants are oxidized to CO_2 and water. The catalysts that are used are known as the platinum group metals (PGMs). These consist of platinum, iridium, osmium, palladium, rhodium, and ruthenium. Platinum is best suited as the catalyst for diesel engine control devices; therefore, it appears that it will be the main catalyst used in diesel catalytic converters. (Kendall, 2002/2003)

DOC effectiveness in reducing PM emissions is normally limited to about 30 percent of diesel PM. This is because the soluble organic fraction portion of diesel PM for modern diesel engines is typically less than 30 percent. Additionally, DOCs increase sulfate PM emissions by oxidizing the sulfur in fuel and lubricating oil, reducing the overall effectiveness of the catalyst. Limiting fuel sulfur levels to 15 ppm allows DOCs to be designed for maximum effectiveness (nearly 100 percent control of soluble organic fraction emissions). DOCs also reduce emissions of HC and CO with reported efficiencies of 76 percent and 47 percent respectively. (Khair, 1999)

DOCs are also very effective at reducing the air toxic emissions from diesel engines. Test data shows that emissions of toxics such as polycyclic aromatic hydrocarbons (PAHs) can be reduced by more than 80 percent with a DOC. (DieselNet, 2002)

Flow Through Filters

Flow through filter (FTF) technology is a relatively new technology for reducing diesel PM emissions. Unlike a DPF, in which only gasses can pass through the substrate, the FTF does not physically "trap" and accumulate PM. Instead, exhaust flows through a medium (such as wire mesh) that has a high density of torturous flow channels, thus giving rise to turbulent flow conditions. The medium is typically treated with an oxidizing catalyst that is able to reduce emissions of PM, HC, and CO, or used in conjunction with

a fuel-borne catalyst. Any particles that are not oxidized with the FTF flow out with the rest of the exhaust and do not accumulate.

The filtration efficiency of an FTF is lower than that of a DPF, but the FTF is much less likely to plug under unfavorable conditions, such as high PM emissions, low exhaust temperatures and emergency circumstances. The FTF, therefore, is a candidate for use in applications that are unsuitable for DPFs.

Combinations

Combinations of more than one technology are also being explored to maximize the amount of diesel PM reduction. For example, fuel-borne catalysts can be combined with any of the three main hardware technologies discussed above: DPF, FTF, or DOC.

C. Cleaner Diesel Fuels, Alternative Diesel Fuels, and Alternative Fuels

Diesel PM emission reductions can also be realized through the use of cleaner diesel fuels, alternative diesel fuels, or alternative fuels (e.g., compressed natural gas). All stationary diesel-fueled engines would be required under the proposed ATCM to use low-sulfur diesel fuel, which will result in modest PM reductions by itself and will also enable the use of advanced exhaust aftertreatment systems for those engines that need DECS to meet the performance standards in the proposed ATCM. There are also some stationary engine operators that have explored the use of alternative diesel-fuels with some success and compressed natural gas fueled stationary engines are in use throughout California. While there are limitations to using alternative diesel-fuels and alternative fuels, particularly with emergency standby engines, we believe they may provide a satisfactory route to compliance for some engine operators. Below we describe some fuel options for stationary engines.

Low Sulfur Diesel Fuel (CARB Diesel)

Lowering the sulfur content of diesel fuel is important to the performance of aftertreatment technologies, particularly DPFs. Sulfur affects filter performance by inhibiting the performance of catalytic materials upstream of or on the filter (i.e., catalyst "poisoning"). This phenomenon not only adversely affects the ability to reduce emissions, but also adversely impacts the capability of these filters to regenerate - there is a direct trade-off between sulfur levels in the fuel and the ability to achieve regeneration. Sulfur also competes with the chemical reactions intended to reduce pollutant emissions and creates particulate matter through catalytic sulfate formation. The availability of low sulfur fuel (i.e., less than 15 ppm) will enable these filters to be designed for improved PM filter regeneration and emission control performance, as well as to reduce sulfate emissions. Indeed, diesel fuel containing less than15 ppm sulfur is required to ensure maximum emission control performance on the broadest range of diesel non-road engines possible. (MECA, 2003)

Recently, the ARB approved amendments to the California diesel fuel regulations. One of the proposed amendments reduces the sulfur content limit from 500 parts per million by volume (ppmv) to 15 ppmv for diesel fuel sold for use in California in stationary source engines, on-road and off-road motor vehicles starting in mid-2006. This reduced sulfur content will provide a small emission benefit because a portion of PM emissions is comprised of sulfates, the formation of which is a direct function of the level of sulfur in the fuel. (Diesel, 2003) The availability of 15 ppm sulfur fuel will also allow after-treatment manufacturers to use more highly active catalysts, which operate effectively at lower temperatures and have a broader range of vehicle applications. Low sulfur diesel is available today for use by centrally fueled fleets in voluntary emission reduction programs, and we believe it will be widely available by 2005 when the ATCM would become enforceable. (Diesel, 2003)

Alternative Diesel Fuels

Alternative diesel fuel is a fuel that can be used in a diesel engine without requiring engine or fuel system modifications for the engine to operate, although minor modifications (e.g., recalibration of the engine fuel control) may enhance performance. Examples of alternative diesel fuels include biodiesel, emulsified fuels, Fischer-Tropsch fuels, or a combination of these fuels with CARB Diesel fuel. A detailed discussion of these fuels is provided in the Diesel Risk Reduction Plan. (ARB, 2000) These alternatives may result in significant benefits for higher-emitting categories, such as off-road engines. Synthetic or alternative diesel fuels may also prove to be part of the preferred control strategy for diesel-fueled engines that would otherwise result in relatively high risk, or where control retrofit options are very expensive or difficult to implement. The emissions effects of these fuels can vary widely. There has not been significant penetration of these fuels into stationary engine applications. However, biodiesel is being used with some success in both prime and emergency standby engines.

Alternative Fuels

Alternative fuels, such as natural gas, propane, ethanol or methanol, are options available to reduce emission from diesel engines. There are several prime stationary engine applications that are successfully using compressed natural gas (CNG) as an alternative to diesel-fuel. These engines have significantly lower emission levels than a comparable engine operating on diesel fuel. An operating cycle for compression ignition engines involves injecting a small amount of diesel along with natural gas into the combustion chamber. The heat generated by compressing this mixture ignites the diesel fuel that in turn ignites the natural gas mixture, operating much like a conventional diesel engine. CNG is available at over 100 retail outlets in California. (CEC, 1999)

For many years, natural gas has been an efficient, clean burning power application for prime engines. Natural gas produces prime power in a wide variety of industries from heat treating to printing. Storage problems (i.e., space and leak containment) and higher

operating costs associated with other fuels are eliminated using natural gas. (Peoples, 2003) Other advantages of using natural gas are the extended time between oil changes and cleaner, cooler combustion compared to diesel or propane fuel.

Natural gas can also be used in some emergency stand by applications. Natural gas is an energy source permitted by National Fire Protection Association (NFPA) Standard for Emergency and Standby Power Systems (NFPA 110). Natural gas would be an appropriate power supply where failure of an emergency power supply source is less critical to human life and safety, for example, heating and air conditioning systems, communication systems, ventilation and smoke removal systems, sewerage disposal, lighting, industrial processes. Natural gas would be inappropriate in safety situations to human life, where an on-site storage tank would be required. (NFPA, 2002)

D. Engine Design Modification or Repower

There are engine modifications that can be employed, generally at the time of an engine rebuild to reduce emissions. Two examples of engine design modifications, that reduce PM emissions are a diesel engine reengineering kit produced by Clean Cam Technology (Clean Cam) and the ECOTIP Superstack Fuel Injectors (ECOTIP) distributed by Interstate Diesel.

Clean Cam consists of specific engine retrofit components, including a proprietary camshaft. The product reduces NOx emissions by increasing the volume of exhaust gas that remains in the combustion chamber after the power stroke. Within the combustion chamber, the residual exhaust gas absorbs heat and reduces the peak combustion temperature, which results in lower NOx emissions. The injection timing can then be adjusted (i.e., advanced) to maximize the diesel PM emission reductions or it can be varied to achieve the desired balance of NOx vs. PM. The product reduced diesel PM and NOx emissions from eleven pre-1993 and four pre-2000 models of two-stroke diesel-fueled engines manufactured by Detroit Diesel Corporation (DDC).

Interstate Diesel takes a different approach with the ECOTIP Superstack Fuel Injectors to reduce emissions from existing engines. This product has been shown to reduce diesel PM emissions from engines manufactured by General Motors Electro-Motive Division (EMD) and DDC. The product consists of a fuel injector with a reduced sac volume and a more consistent fuel injection pressure, and it can be incorporated into either mechanical or electronic fuel injection systems. The product improves combustion and reduces diesel PM emissions by minimizing the amount of fuel that drips into the combustion chamber at the end of the chamber's fuel injection cycle. The manufacturer states that the overall diesel PM removal efficiency can be as high as 44 percent for EMD engines and as high as seven percent for DDC engines. The product is commercially available and has been installed on approximately 2,000 diesel-fueled engines.

Repowering (i.e., replacing the engine) can be a viable and cost-effective way to reduce emissions from older uncontrolled diesel engines. (Diesel, 2003) Heavy-duty diesel

engines manufactured today are significantly cleaner than those built just a short time ago and can provide significant NOx and PM benefits when compared to an older engine. Repowering can be particularly cost-effective in situations where the engine would have been removed anyway for a rebuild. (Diesel, 2003)

Another alternative is to replace a diesel-fueled engine with a fuel cell. Fuel cells have captured worldwide attention as a clean power source and have generated interest and enthusiasm among industry, environmentalists, and consumers. In principal, a fuel cell operates like a battery. A fuel cell converts chemical energy directly into electricity by combining oxygen from the air with hydrogen gas. However, unlike a battery, a fuel cell does not run down or require recharging. It will produce electricity as long as fuel, in the form of hydrogen, is supplied. Fuel cells have been a reliable power source for many years. Installations have occurred at Kaiser Hospitals in Anaheim and Riverside, the University of California at Irvine, Las Virgenes Municipal Water District in Calabasas, the Chevron Texaco Headquarters building in San Ramon, and several military installations, to name a few. Applications include electrical power supply for space flights, as well as conventional electric power generation in buildings and power plants. Fuel cell manufacturers are looking at all markets; one specific market is for smaller applications, including premium power applications, rural and remote applications, residential power applications, backup power for telecommunications systems and cell towers, and other premium power applications. At current prices, fuel cells are most suitable for power applications where the cost of the fuel cell is not a primary issue when compared, for example, to the loss of critical equipment and data. (CSFCC, 2002)

E. Reducing Hours of Operation

Reducing the number of hours an engine is operated may be an available option to reduce diesel PM emissions for some diesel power sources, particularly for emergency standby engines. In cases where an alternative fuel, emission control device, or repowering are not practical or economically feasible, owners of emergency standby engines may consider reducing the hours of operation for maintenance and testing to reduce emissions. Non-life-critical emergency back up generators could reduce hours of operation for maintenance and testing. NFPA 110 offers suggested standards for generator maintenance and testing of 30 minutes per month. (NFPA, 2002) Depending on individual power needs, the NFPA 110 maintenance and testing standards could be followed in cases where operators are unnecessarily operating more than the recommended six hours annually for maintenance and testing, thereby reducing the diesel PM emissions.

F. Verification of Diesel Emission Control Devices

In support of the ARB's regulatory efforts to reduce diesel PM, the *Verification Procedure, Warranty and In-Use Compliance Requirements of In-Use Strategies to Control Emissions from Diesel Engines* (Verification Procedure) was adopted by the Board in March 2002. The Verification Procedure establishes a process through which

manufacturers of emission control equipment can demonstrate and verify the emission reduction capabilities of control technologies. Examples of emission control technologies that can be considered for verification include diesel particulate filters, diesel oxidation catalysts, exhaust gas re-circulation, selective catalytic reduction systems, fuel additives and alternative diesel fuel systems. The Verification Procedure is voluntary and applies to emission control technologies for on-road, off-road and stationary applications. While the proposed ATCM does not require the use of verified systems to demonstrate compliance, some operators may choose to purchase a verified system. A brief discussion on the Verification Procedure is provided in this section.

The Verification Procedure requires emission control strategy applicants to establish the emissions reduction capabilities for a emission control device, conduct a durability demonstration, conduct a field demonstration and submit results along with other information in an application to the ARB following a prescribed format. The applicant verifies the product for a specific engine manufacturer, years produced, engine family and series. If the ARB approves the application, it will issue an Executive Order to the applicant stating the verified emission reduction and any conditions that must be met for the diesel emission control strategy to function properly. The Verification Procedure also requires that the applicants provide a warranty to the end-user and conduct in-use compliance testing.

The results of the Verification Procedure testing determine the control technology classification. The multi-level verification system consists of three PM reduction levels. The Verification Procedure also has provisions for verifying strategies that reduce NOx emissions. Control device verifications for both PM and NOx are classified by level as listed in Table VI-1.

Table VI-1: Verification Classifications for Diesel Emission Control Strategies

Pollutant	Reduction	Classification
PM	<25%	Not Verified
	≥ 25%	Level 1
	≥ 50 %	Level 2
	≥ 85% or ≤0.01 g/bhp-hr	Level 3
NOx	<15%	Not Verified
	≥15%	Verified in 5% increments

Once a device has been verified, the executive order and accompanying information is posted on the ARB's web site at http://www.arb.ca.gov/diesel/verifieddevices/verdev.htm.

With respect to verification for stationary applications, CleanAIR Air Systems received verification on June 6, 2003, for its PERMIT™ filter for 85 percent particulate reduction. The Table VI-2 below outlines specific operating criteria for the verified CleanAIR Systems diesel particulate filter. (ARB, 2003b)

Table VI-2: CleanAIR Systems PERMIT™

Maximum consecutive minutes at idle	240 minutes
Number of 10 minute idle sessions before regeneration is required	Regeneration recommended after 12 consecutive sessions; required after 24
Minimum temperature/load/time requirements for regeneration in 4-stroke engine	300° Celsius for 30% of operating time or 2 hours, whichever is longer. For most engines, 40% load results in temperature of at least 300°Celsius
Number of hours of operation before cleaning/disposal of filter	5000 hours under normal operating conditions
Fuel	Diesel sulfur content must not exceed 15 parts per million by weight
PM emission/certification level	Equal or less than 0.1 g/bhp-hr (as tested on an appropriate steady-state certification cycle outlined in the ARB off-road regulations - similar to ISO 8178 D2)
Cycle	Four-stroke

There are also three additional emission control technologies, one fuel additive one DPF and one DOC, currently going through the verification process that are applicable to stationary engines.

G. In-Use Experience with Diesel PM Emission Control Strategies

To verify that control technologies are commercially available and have been demonstrated, ARB staff interviewed operators of stationary engines that have actual experience with a variety of DECS, alternative diesel-fuels or alternative fuels. Questions on operating performance, reliability, and effectiveness were asked to provide a better understanding of the actual in-use performance of available DECS or alternative fuels and the technological feasibility of the proposed performance standards in the ATCM. Operators of both emergency standby and prime engines were interviewed.

Emergency Standby Engines: In-Use Experience

There are numerous emergency standby engines in California that have DPFs or DOCs installed. As shown in Table VI-3, installed DECS are reducing diesel PM emissions on engines providing emergency back-up power to a variety of industries. ARB staff interviewed representatives from eight of the facilities to determine actual in-use experience. Summaries of the interviews are provided below. The DECS were installed on model year engines ranging from 1993-2002. The most common technologies are DPFs. Of those interviewed, most stated that the DECS required little or no extra maintenance. Most companies installed the DECS to meet the local air pollution control permit requirements and others to reduce odor complaints from

neighbors. Many of the engines had source test data to support the emission reductions. All of the engines were on a regular maintenance and testing schedule.

There are also emergency standby engines that are currently using alternative fuels. ARB staff interviewed engine owners currently using biodiesel or compressed natural gas. Biodiesel offered a large reduction in diesel PM emissions. There was minor extra maintenance required to prevent biodiesel (B50) from clogging fuel filters. A drawback to biodiesel is the increase in NOx emissions that occur particularly with the blends having a larger portion of biodiesel. Natural gas powered engines offer a non-diesel power source. For example, the Advanced Micro Devices (AMD) engine is used for emergency backup and participating in a peak shaving program. Feedback from owners is that natural gas engines do not require extra maintenance. A paragraph about AMD natural gas engines and Mt. Rainer National Park using biodiesel provides more details on in-use experience with alternative fuels.

Table VI-3: In-Use Emergency Standby Stationary Engines with DECS

Location	Facility Type	Engine Make and Horsepower	Emission Control System
San Joaquin Valley APCD, CA	Public Works	Caterpillar 3516B 2848 hp	CleanAIR Systems DPF
Bay Area AQMD, CA	County Service Center	Cummins KTTA 50-G2 2220 hp	CleanAIR Systems DPF
Butte County AQMD, CA	Brewery	(2) Caterpillar 3412 1100 hp each	Engelhard DPF
Bay Area AQMD, CA	Communications	(3) Caterpillar 3516 2479 hp each	Engelhard DPX
Bay Area AQMD, CA	Communications	Caterpillar 512 1005 hp	Engelhard DPX
Bay Area AQMD, CA	Communications	Caterpillar 3516B 2479 hp	Engelhard DOC
San Joaquin Valley APCD, CA	Medical Center	Caterpillar 3406 519 hp	Engelhard DPX
San Joaquin Valley APCD, CA	Hospital	Caterpillar 3516B 2680 hp	CleanAIR Systems DPX
Bay Area AQMD, CA	Communications	Caterpillar 3412C 896 hp	CleanAIR Systems
Tehama APCD, CA	Communications	Caterpillar 3406 449 hp	DCL MINE-X SOOTFILTERS®
Colusa County APCD, CA	Communications	Caterpillar 3406 449 hp	DCL MINE-X SOOTFILTERS®
Bay Area AQMD, CA	Communications	Caterpillar 1800 hp	Ceryx Quad Cat
Butte County AQMD, CA	Communications	Detroit Diesel 7243 1550 hp	CleanAIR Systems
Bay Area AQMD, CA	Communications	(6) Caterpillar 3516 2000 hp	Unknown

Table VI-3 (continued)

Location	Facility Type	Engine Make and Horsepower	Emission Control System
Bay Area AQMD, CA	Candy Company	Caterpillar 3516B 2680 hp	CleanAIR Systems
San Diego County AQMD, CA	Data	(2) Caterpillar 1072 and 536 hp	Caterpillar DPF
San Diego County AQMD, CA	Hotel	(2) Caterpillar 175 hp	Caterpillar DPF
Butte County AQMD, CA	Communications	Cummins KTA50-G9 2200 hp	Nett Technologies
San Joaquin Valley APCD, CA	Communications	Caterpillar 3406 587 hp	Englehard DPX, DPF
San Joaquin Valley APCD, CA	Unknown	John Deere 6076 300 hp	Unknown
Bay Area AQMD. CA	Communications	Caterpillar 3412C 804 hp	CleanAIR Systems
South Coast APCD, CA	Construction	Caterpillar 3512B 1876 hp	CleanAIR Systems
Bay Area AQMD, CA	Communications	Caterpillar 3516B 2680 hp	CleanAIR Systems
Bay Area AQMD, CA	Data	Caterpillar 3406C 536 hp	CleanAIR Systems
Bay Area AQMD, CA	Data	Perkins 3.8L, 80.4 hp	CleanAIR Systems
San Luis Obispo County APCD, CA	Energy	Cummins KTTA50 2142 hp	CleanAIR Systems
San Joaquin Valley APCD, CA	Hospital	Caterpillar 3516B 2680 hp	CleanAIR Systems
Bay Area AQMD, CA	Equipment Sales	Caterpillar 3508 1340 hp (2) Caterpillar 3512C 804 hp (2) Caterpillar 3506C 536 hp	CleanAIR Systems
San Joaquin Valley APCD, CA	Equipment Sales	Detroit Diesel Series 60 335 hp	CleanAIR Systems
San Diego County AQMD, CA	Municipality	Caterpillar 3512 1608 hp	CleanAIR Systems
South Coast APCD, CA	Manufacturer	Isuzu 4GB1 67 hp	CleanAIR Systems
Unknown	Power Generation	(10) Various	CleanAIR Systems
Various	Various	(7) Various	Various Systems

Emergency Standby Engines: Summaries of Interviews Regarding In-Use Experience

Kings County Department of Public Works: Kings County Department of Public Works, located in Hanford, California, installed a CleanAIR Systems Inc. Permit™ catalyzed diesel particulate filter on a diesel-fueled Caterpillar 3516B 2000 kilowatt (kW) generator set operating on CARB low sulfur diesel fuel (<15 ppm sulfur). The engine is model year 2000 and is used for emergency power and complies with an interruptible load

contract with Southern California Edison. An interruptible contract allows Kings County to receive electricity at a reduced cost but must disconnect from the local utility when notified. According to the Kings County Public Works Director, the engine has run over 800 hours since installation in 2001 and they have not experienced any problems with the DPF. CleanAIR Systems removed the filter after 556 hours to inspect soot build up which would indicate if the DPF was regenerating properly. The inspection results revealed very clean filters, which indicate the engine was reaching and sustaining adequate temperatures to ensure regeneration. Emission testing of the engine, with and without the DPF installed, was also conducted and demonstrated that the DPF was reducing emissions by 85 percent. The emissions test also provided information to verify the PERMIT™ system with the ARB. (ARB, 2003b) (NESCAUM, 2003) (Kings, 2003)

Santa Clara County: Santa Clara County operates a standby emergency generator set, located at the Santa Clara County Government Facility located in San Jose, California. In 1997, Santa Clara County installed a CleanAIR Systems, Inc. CleanDIESEL™ soot filter DPF on a diesel-fueled Cummins Model KTTA 50-G2 operating on CARB Diesel fuel. The engine is a V-16, 2220 horsepower at 1,800 rpm, 3067 cubic inch turbo charged engine. The exhaust is configured with twin exhaust outlets, each of which is equipped with CleanDIESEL™ soot filters. The engine operates an Onan Model 1500 DFMP generator with a rated output of 1500 kW. A representative with Santa Clara County stated the DPF was installed to eliminate odor and employee complaints. The ARB completed source tests on this engine exhaust with and without the DPF in place. The engine was running at 100 percent load, and a CARB Method 5 (Determination of Particulate Matter emissions from Stationary Sources) was used to determine emission levels. Based on the results, when considering the front half as recommended in the proposed ATCM, the DPF had an efficiency of approximately 75 percent. Using the total PM (front half and back half), the efficiency was much lower due to an unusually high contribution from the back half. (NESCAUM, 2003) (Santa Clara, 2002) (Santa Clara, 2003)

Sierra Nevada Brewery: Sierra Nevada Brewery Company (SNBC) located in Chico, California installed Engelhard DPX DPFs on a pair of CARB diesel fueled Caterpillar 3412 engines each driving 750 kW generators. The engine exhaust is configured with twin exhaust outlets, each of which is equipped with DPFs. In 1997 and 1999, the engines were purchased to produce emergency electrical power. To meet air quality requirements, SNBC installed the DPFs in 1999 and 2000. The ARB has completed emissions tests on the engines. The emission controls system reduces diesel PM emissions by 85 percent from 0.164 g/bhp-hr to 0.025 g/bhp-hr. The Sierra Nevada Brewery has not had any problems with the DPFs. According to a Sierra Nevada Brewery representative, they identifed two disadvantages with the DPFs. First, the engine must run a little longer to reach temperature high enough to burn off soot buildup, and second, there was higher initial cost for the dual exhaust added to eliminate potential back-pressure problems and filter assemblies. (SNB, 2003) (NESCAUM, 2003) (Sierra, 2000)

SBC Telecommunications: SBC Telecommunications (SBC), has five emergency backup generators located in San Francisco and one engine in San Jose that have been retrofitted with diesel emission control strategies. SBC had ECS's installed on each of the emergency backup generator engines to respond to smoke and odor complaints.

SBC in San Francisco has five Caterpillar emergency backup engines powering generators with ECS's installed on the engines. In 1993 four Englehard DPFs were installed on three Caterpillar 3516 and one Caterpillar 3516B, 2479 horsepower engines. In 1999, an Englehard DPF was installed on a Caterpillar 3512, 1005 horsepower engine. All of the engines burn CARB diesel fuel. A representative of SBC stated that the emission control strategies were installed to reduce both particulate emissions and odor complaints. The engines are exercised for about an hour per month for maintenance and testing. To reduce public's exposure to exhaust emissions the engines are run early in the morning but the odor complaints continued. Subsequent inspections revealed that the encased Engelhard DPX filters cracked and repairing the cracked unit was difficult. The Englehard DPX filters remove CO, HC and PM. (SBC, 2003) (NESCAUM, 2003)

Emissions tests were completed on the Caterpillar 3516 engines. The results revealed the engines were emitting 0.239 g/bhp-hr prior to emission controls, with an ECS installed the PM emissions were reduced to 0.036 g/bhp-hr (85 percent reduction). (NESCAUM, 2003) (SBC, 2003)

In San Jose SBC installed a Englehard DOC on a Cummins KTA50-G9, turbocharged and aftercooled, 2,220 horsepower engine burning #1 or #2 diesel fuel powering an emergency generator. The engine is exercised for an hour per month for maintenance and testing. An emission test showed a 25 percent reduction of diesel PM emissions with the DOC installed. When the engine was installed in 2000, a DOC was mounted on the exhaust to control odors. Since installation odor complaints have been eliminated. (SBC, 2003) (NESCAUM, 2003)

Memorial Hospital of Los Banos: Memorial Hospital of Los Banos in Los Banos California installed an Engelhard DPX diesel particulate filter on a 1994 Caterpillar 3406, 519 horsepower engine operating an emergency backup generator. The particulate filter was installed in 2002 to satisfy San Joaquin Valley Air Pollution Control District emission permit requirements. The hospital runs the engine about 30 minutes per week for maintenance and testing. The exhaust temperature is monitored during the weekly engine test. According to an engineer with Memorial Hospital of Los Banos, the exhaust gas temperature reaches 1000 degrees F, for 30 percent of the run time, which is sufficient to regenerate trapped diesel PM and keep the filter clean. Annual turning over of the DPF units is the only maintenance the unit would need. The filter has not been turned over because the engine produces high exhaust temperatures. (Los Banos, 2003)

Fresno Regional Medical Center: Fresno Regional Medical Center in Fresno, California installed a PERMIT™ CleanAIR catalyzed diesel particulate filters on five 2002 Caterpillar 3516TA, 2680 horsepower engines that power Caterpillar SR4 B emergency backup generators. As part of the SJVAPCD permit, the medical center was required to reduce PM emissions. Emission information was provided to the project manager at the Medical Center. The data stated a Caterpillar generator will produce 0.10 g/bhp-hr PM emissions without an emission control device. The Caterpillar generator running on CARB diesel and a particulate filter has PM emissions reported at 0.01 g/bhp-hr. The PERMIT™ System being used by the Fresno Regional Medical Center has been verified by the ARB. The generator units are new and scheduled maintenance has not needed to be performed. (Fresno, 2003a) (Fresno, 2003b)

Intel Corporation: Intel Corporation located San Jose California, installed two CleanAIR Systems diesel particulate filters a Caterpillar 3412C, 896 horsepower engine which powers an emergency backup generator. The facilities manager stated that they have not had any problems with the emission control device and there is no extra maintenance. Intel has not had an emergency to use the engine for an extended period of time, the engine runs 30 minutes per month for maintenance and testing purposes. (Intel, 2003)

Sierra Pacific Power Company: Sierra Pacific Power Company (SPPC) owns and operates two diesel powered electric generators at a substation located at Kings Beach in Northern California. The two diesel engines at the substation are General Electric Model 20-645-E4, 20 cylinder, turbo-charged engines. B100 (100 percent biodiesel) was used to minimize emissions. Testing was completed on one of the engines under 90 to 100 percent load. The first test was completed on December 1990 using off-road diesel fuel a second test was completed September 2002 using B100 fuel. Table VI-4 summarizes test results performed comparing off-road diesel and biodiesel. The emission testing demonstrated over 40 percent reduction in total PM. There was also about a 30 percent increase in NOx emissions. At this time the decision as to whether or not to use biodiesel has not been made. (Tetra Tech, 2002)

Table VI-4: Biodiesel (B100) Emission Reductions vs. Off-Road Diesel

Emissions	Reductions
Filterable PM	63.5%
Total PM	42%
CO	28%
SO2	92%
NOx	+32%

Pacific Gas and Electric: Pacific Gas and Electric, Kettleman Station (PG&E) is located in Avenal, California installed a natural gas fired emergency generator in 2000. Because PG&E is a company that supplies natural gas, the decision to run the

emergency engine on natural gas was straightforward. The engine is a 2000 Caterpillar 63512 EPG, 414 horsepower engine. The engine runs about four hours per week at 25 to 30 percent load. According to the engine operator, the natural gas engine requires no special maintenance. The local air quality district has not required emission tests on this engine. (PG&E, 2003)

Advanced Micro Devices: Advanced Micro Devices (AMD) located in Sunnyvale, California purchased a natural gas powered emergency backup engine in late 2001. The engine is a 16V-AT27EL Waukesha engine producing 4073 horsepower. The Waukesha engine is turbo-charged, after-cooled, and lean burning. The engine was installed to prevent rolling blackouts. When notified of a rolling blackout, AMD must reduce the load from the power grid by 15 percent in 15 minutes. This engine will remove 15 percent of the load keeping the Sunnyvale facility powered. Currently the engine is participating in a peak shaving program and has been running since May 2003, five days a week for seven hours a day. The AMD Environmental Health and Safety Department stated that natural gas combustion has not caused engine problems. (AMD, 2003)

Prime Engines: Summaries of Interviews Regarding In-Use Experience

Prime engines also utilize different strategies to reduce diesel PM emissions. Most of the prime engine owners interviewed by the ARB staff installed DECS to meet local air district permit requirements. Source tests have been completed on the engines, some comparing the before and after effects of the control device. Natural gas is a common alternate fuel. The South Coast Air Quality Management District requires new prime engines to run on an alternative fuel. An extensive database listing prime engines has not been compiled. Table VI-5 below provides examples of prime engines with emission control devices installed, followed by interviews with some of those engine owners.

Table VI-5: In-Use Prime Stationary Engines with DECS

Location	Facility Type	Application	Engine Make and Horsepower	Emission Control System
San Joaquin Valley Unified APCD, CA	Parks and Recreation Department	Water Pump	John Deere 6068TF150 155 hp	Cleaire DPF
Northern Sierra APCD, CA	Rock Crushing Facility	Rock Crusher	Caterpillar 3406 587 hp	DOC
Bay Area AQMD, CA	Port Terminal	TRU Generator	Cummins KTA19G3 685 hp	DPF
Bay Area AQMD, CA	Recycling	Wood Chipper	Caterpillar 3412 750 hp	DOC
Bay Area AQMD, CA	Recycling	Wood Chipper	Caterpillar 3412 DITTA 800 hp	DPF, DOC
San Diego County APCD, CA	Waste Water	Electric Power Generation	Caterpillar 3512B 1718 hp	Clean Diesel Technology Platinum Plus DFX
San Joaquin Valley Unified APCD, CA	Public Works	Electric Power Generation	Caterpillar 3516B 2848 hp	DPF
San Diego County APCD, CA	Ship Construction	Gantry Crane	Cummins (2) QST30-G1-NR1 (2) QSX-15-G9 QST30-G1-NR2 QST30-G1-NR3	Engelhard DPX SCR
San Diego County APCD, CA	Dam Project	Power Supply	Caterpillar (6) 3516B	Engelhard DPX SCR

Kern County Parks and Recreation: Kern County Parks and Recreation Department in Kern County California, placed a Cleaire C-DPF on 1978 John Deere 6068TF150, 155 horsepower engine in 2002, burning off-road diesel fuel. The engine is used to pump water to a local campground at Lake Ming. The catalyzed diesel particulate filter was installed to satisfy San Joaquin Valley Air Pollution Control District permit requirements. The engine runs about 4 hours per day, approximately 784 hours per year. According to representatives of the Kern County Parks and Recreation Department there have been no problems or additional maintenance with the engine associated with the diesel particulate filter. (Kern, 2003)

TransBay Container Terminal Incorporated: TransBay Container Terminal, Inc. (TransBay) is located at the Port of Oakland in Oakland California. A diesel particulate filter was installed in March 2001 on a 1995 Cummins DTA19G3, 685 horsepower engine. The engine runs a generator and burns off-road diesel fuel. The diesel particulate filter was installed to reduce emissions of diesel PM meeting requirements of the Port of Oakland and the Bay Area Air Pollution Control District. The engine is used daily and runs about 1450 hours per year at about 50 percent load. A TransBay representative stated that they have not had any problems with the diesel particulate filter. (TransBay, 2003)

City of San Diego Metropolitan Waste Water Department: The City of San Diego MWWD, in San Diego California have installed a Clean Diesel Technology Platinum Plus DFX diesel particulate filter on a 1997 Caterpillar 3512B, 1718 horsepower engine. The engine powers a generator to produce electrical power by burning diesel fuel and digester gas. The generator produces 1200 kW of power and uses 22.2 gph diesel and 15,941 scf of digester gas. Burning 100 percent diesel at 1200 kW the engine consumes 100 gpm. The lead operator of the engine stated that the filters have been clogging. They sent soot samples to a laboratory for analysis. The analysis revealed the soot is comprised primarily of inorganic silicates from the digester gas. The clogging will be resolved by cleaned the filter every 3 weeks. San Diego County Air Pollution Control District (SDCAPCD) required the engine to install a diesel particulate filter and limited the hours of use to 730 per year. (San Diego, 2003a) (San Diego, 2003b) (San Diego, 2003c) (San Diego, 2003d)

Zanker Road Resource Management, Ltd: Zanker Road Resource Management, Ltd. (Zanker Road) is recycling plant and small landfill located in Milpitas, California. They have installed a DOC unit on a 1996 Caterpillar 3412 750 horsepower engine. Zanker Road has also installed a DOC/DPF unit on a 1999 Caterpillar 3412DITTA, 800 horsepower engine. Both engines burn off-road diesel fuel and are used to power wood chippers. The engine operator with Zanker Road did not know the manufacturer of the emission control units but did know they are very large, almost as large as the engine itself. A framework has been built to hold the emission control device. The wood chipper unit vibrates during operation originally causing cracks in the framework bracing. The crack has been fixed and more bracing was added to reduce vibration effects. (Zanker, 2003)

National Steel and Shipbuilding Company (NASSCO): NASSCO is located in San Diego California has six gentry cranes with emission control devices installed. The Cummins engines are four QST-30-G1 and two QSX-15-G9, produce 1030 and 680 horsepower respectively. The engines run between 1075-3761 hours per year. The engines have Engelhard DPX catalyzed diesel particulate filters to remove particulate matter. Additionally, the engines have selective catalytic reduction system with urea injection, controlling NOx emissions. A 40 percent aqueous solution of urea is used as a reagent. Urea is injected into the exhaust at 0.34 gallons per hour with less than 10 ppm ammonia slip. Exhaust gas temperatures are maintained above 715° F with an exhaust heater to properly regenerate the DPF. The SCR requires temperatures above 570° F to remove NOx efficiently. Air pollution control equipment was installed to meet San Diego County Air Quality District requirements. (NESCAUM, 2003)

Mt. Rainer National Park: Mt. Rainer National Park is currently converting all diesel applications to biodiesel fueled engines (prime and emergency standby). A B50 biodiesel blend was selected to run the engines at the park. B50 is a blend of 50 percent diesel fuel and 50 percent biodiesel fuel. According to the maintenance manger at Rainer National Park, a 90 kW generator located in a remote area has been using B50 for fuel. This engine runs 24 hours a day 3 months of the year. When they began using B50 fuel the engine was having problems with a fuel filter clogging. The problem was resolved by changing the fuel filter during regular scheduled maintenance. The fuel filters are changed monthly on the snow removal equipment to avoid filter clogging. They are currently replacing the diesel fuel blend to an ultra low sulfur diesel fuel. (Mt. Rainer, 2003)

Fetzer Five River Ranch Winery: Fetzer Five River Ranch Winery (Fetzer) located in Paso Robles, California installed two used 1963 Waukesha F-817 engines that have been configured burn natural gas. The engines are used to power refrigeration units controlling fermentation at the winery. Combined the engines run a total of 600 hours per year mainly from August to October. The decision to run on natural gas was by the winery to do an environmentally friendly alternative to diesel. The operations manager stated the engines have not required extra maintenance because they burn natural gas. (Fetzer, 2003)

H. Diesel PM Control Technology Demonstration Program for Stationary Applications

As discussed earlier, there are a number of potentially effective emission control technologies that can be used to reduce diesel PM emissions from diesel-fueled engines. To further investigate the effectiveness of these technologies for stationary diesel-fueled engine applications, ARB under took a demonstration program. The stationary engine control device demonstration was performed in conjunction with a California Energy Commission Back-up Generator Program. (CEC, 2001) The demonstration included testing of backup generators for baseline emission levels, retrofitting selected engines with commercially available diesel PM control devices, and

testing controlled emission levels. Emissions were tested for PM, total hydrocarbons (THC), methane, nonmethane hydrocarbons (NMHC), CO_2, CO, NO_x, NO_2 using ISO 8178 1992-05-25 Parts 1, 2 and 4 testing procedures. (ISO/DP 1878, 1992) A five-mode D2 test cycle was used in all emission testing. The program was designed to support the testing and data requirements for control device verification under ARB's Verification Procedure. To support verification, the test protocol included baseline and initial control efficiency testing. Durability and post-durability control efficiency are currently in progress. Emission testing was performed by University of California, Riverside, Bourns College of Engineering-Center for Environmental Research and Testing (UCR CE-CERT) under the direction of Wayne Miller, Ph.D. Additional details on the demonstration program are provided in Appendix H.

Control Technologies

Diesel PM control technologies were selected for demonstration based on a number of criteria: projected diesel PM control efficiencies, commercial availability, demonstrated infield use, willingness of manufacturer to complete the verification process, and product cost. Devices were selected that were projected to meet varying levels of diesel PM control. Technologies included emulsified diesel fuel, diesel oxidation catalysts, flow through filter technology, and both active and passive particulate filters. When recommended by the control technology manufacturers, fuel-borne catalysts were used to enhance or promote regeneration. The control device technologies that were tested are described in Table VI-6.

Table VI-6: Control Strategies Included in Demonstration Program

Control Device Manufacturer	Product	Product Description
Lubrizol-Engine Control Systems	Sequentially Regenerated Combifilter	Triple bank silicon carbide particulate filter with online filter regeneration by electrical heating (Active DPF).
Johnson Matthey	Continuously Regenerating Trap (CRT)	Catalyzed diesel particulate filter (Passive DPF).
Sud Chemie	SC-DOC	Diesel Oxidation Catalyst (DOC 1).
CleanAir Systems Flow-Thru-Filter System and Clean Diesel Technologies (CDT) Fuel-Borne Catalyst	Flow-Thru-Filter System combined with CDT Fuel-Borne Catalyst	Combined system includes a DOC, flow through filter used with a CDT fuel-borne catalyst. The flow through filter component was removed prior to testing due to lower than required exhaust temperatures (DOC with Fuel-Borne Catalyst or DOC/FA).
Chevron	Proformix Fuel	Water emulsified fuel (20% water emulsification) utilizes Lubrizol's PuriNOx™ technology (Emulsified Fuel).
Catalytic Exhaust Products Particulate Filter and Clean Diesel Technologies Fuel-Borne Catalyst	SXS-B/FA combined with CDT Fuel-Borne Catalyst	Uncatalyzed diesel particulate filter used with a CDT fuel-borne catalyst (Particulate Filter with Fuel-Borne Catalyst).

Results from the Demonstration Program

Active and passive diesel particulate filters, diesel oxidation catalysts, and emulsified diesel fuel technologies were tested for generator applications. Emission testing was conducted according to ISO-8178 test procedures using the D2 test cycle. The results from the testing are presented in Table VI-7. As can be seen, the D2 weighted emission factors and diesel PM control efficiencies for both active and passive DPF technologies were better than 90 percent. The technologies were capable of regenerating under the intermittent cold start maintenance cycling and loaded operation, typical for backup generators. While the passive CRT DPF did have increased levels of NO_2, overall NOx levels decreased for both active and passive DPFs. The actively regenerating system showed better than 99 percent reduction for diesel PM, with regeneration independent of exhaust temperature by design. For the active DPF system, issues involving high backpressure levels and active regeneration control design were identified and will be addressed during future system design for stationary sources. The results from the demonstration testing indicate that both active and passive technologies are effective in reducing diesel PM better than 85 percent.

The effectiveness of diesel oxidation catalysts reportedly depends on the level of soluble organic fraction in the exhaust PM relative to the elemental carbon fraction (EC/OC ratio). Comparison testing on two engines showed that for low ratios of organic diesel PM components, diesel PM control effectiveness was lower than anticipated. Where the ratio of organic components was higher, the control efficiency increased significantly. Testing of two commercially available DOC technologies on a 1985 two-stroke Detroit Diesel V92 showed control efficiencies in the range of 40 to 46 percent for diesel PM and 53 to 69 for NMHC. There were slight NOx increases, less than 10 percent, that may be attributed to differences in ambient conditions during testing. Demonstration testing indicates that DOC technologies are effective in providing better than 30 percent PM control efficiency for appropriate engine types.

Testing of emulsified fuels for two different Caterpillar engines resulted in a wide range of control efficiency for diesel PM, ranging between 18 to 73 percent. Control efficiencies for NMHC were even more varied, ranging from a decrease of 60 percent to an increase of 12 percent. For both tests, NOx reductions ranged from 3 to 14 percent. These wide variations in test results indicate that further testing is required, but for certain engine types, emulsified fuel could be a very effective technology to reduce diesel PM significantly, while also providing reductions in NOx.

In conclusion, ARB staffs believe the results of the control device demonstrations indicate that diesel PM control technologies are available to provide a wide range of reduction levels for appropriate engines and applications. Durability testing of the DPF and DOC systems for intermittent cold start and extended high load operation indicates that these technologies are effective for generator applications and may be effective for other steady-state stationary engine applications, as well. Each of the tested technologies is currently commercially available for retrofit applications.

Table VI-7: Summary of D2 Weighted Emission Factors and Control Efficiencies

		Average D2 Weighted Emission Factors (gm/bhp-hr)						
Configuration	Fuel	100% Load (HP)	THC	CH_4	NMHC	CO	NOx	PM
2000 CAT 3406C with Johnson Matthey CRT Passive DPF								
Baseline	CARB Diesel	465.9	0.087	0.015	0.074	1.041	6.608	0.142
Controlled	ULSD	467.1	0.007	0.003	0.004	0.228	6.212	0.012
Percent Reductions			92.3	82.6	94.1	78.1	6.0	91.4
2000 CAT 3406C with ECS Sequentially Regenerated Combifilter Active DPF								
Baseline	CARB Diesel	465.0	0.082	0.017	0.067	1.468	6.783	0.159
Controlled	ULSD	458.8	0.050	0.015	0.037	1.645	6.042	0.0003
Percent Reductions			39.5	16.1	44.7	-12.1	10.9	99.8
1985 2 stroke Detroit Diesel V92 with CleanAir Systems DOC and CDT Fuel-Borne Catalyst								
Baseline	CARB Diesel	389.6	0.659	0.053	0.613	1.715	10.785	0.201
Controlled	ULSD+FBC	389.6	0.200	0.014	0.188	0.100	11.545	0.121
Percent Reductions			69.6	73.0	69.3	94.1	-7.0	40.0
2000 CAT 3406C with Sud Chemie DOC								
Baseline	CARB Diesel	465.0	0.082	0.017	0.067	1.468	6.783	0.159
Controlled	CARB Diesel	467.7	0.011	0.002	0.009	0.058	7.168	0.129
Percent Reductions			86.7	90.3	85.9	96.0	-5.7	18.8
1985 2 stroke Detroit Diesel V92 with Sud Chemie DOC								
Baseline	CARB Diesel	389.6	0.659	0.053	0.613	1.715	10.785	0.201
Controlled	CARB Diesel	393.5	0.307	0.022	0.288	0.206	10.860	0.107
Percent Reductions			53.4	58.2	53.1	88.0	-0.7	46.9
1986 CAT 3406B with Emulsified Diesel								
Baseline	CARB Diesel	399.3	0.147	0.027	0.124	0.679	11.321	0.093
Controlled	Emulsified Fuel	363.1	0.161	0.026	0.139	0.496	10.914	0.076
Percent Reductions			-9.7	2.4	-12.0	27.0	3.6	17.8
Post- 96 CAT 3406C with Emulsified Diesel								
Baseline	CARB Diesel	469.0	0.163	0.031	0.270	1.234	6.512	0.150
Controlled	Emulsified Fuel	469.0	0.131	0.027	0.108	0.820	5.563	0.041
Percent Reductions			19.4	13.1	60.0	33.6	14.6	72.7

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VII. REGULATORY ALTERNATIVES

ARB staff evaluated four alternative strategies to the current proposal. Based on the analysis, none of the alternative control strategies were considered more effective than the proposed regulation. Full implementation of the proposed regulation is necessary to achieve ARB's goal, as described in the Diesel Risk Reduction Plan, to reduce by 85 percent diesel PM emissions and associated potential cancer risks by 2020. (ARB, 2000) The proposed regulation provides owners or operators of stationary diesel-fueled CI engines with flexibility in determining the most cost-effective control strategy that will meet the proposed emission standards and operational requirements for their operation.

A. Do Not Adopt This Regulation

With full implementation of the proposed regulation, the estimated reduction in diesel PM is approximately 80 percent in 2020 relative to the 2002 baseline from stationary engines used in non-agricultural applications. The recommended control options should reduce diesel PM emissions to the lowest level achievable through the application of best available control technology or a combination of one or more effective control methods. These estimated reductions in diesel PM are an important element in the Diesel Risk Reduction Plan, and along with other control measures to be adopted by the ARB will contribute to reducing cancer and noncancer health risks to the public associated with inhalation exposure to emissions of diesel PM. Short-term exposure to diesel PM emissions may cause acute or chronic noncancer respiratory effects such as irritation of the eyes, throat, and bronchial passages. It has also been concluded that inhalation of diesel PM emissions can cause neurophysiological symptoms such as lightheadedness or nausea. Additional benefits of the proposed regulation would be a reduction in acute or chronic noncancer health effects associated with inhalation exposure to diesel PM emissions.

The ARB is required by H&SC Section 39658 to establish ATCMs for TACs. Further, H&SC Section 39666 requires the ARB to adopt ATCMs to reduce emissions of TACs from nonvehicular sources. In consideration of ARB's statutory requirements and the recognized potential for adverse cancer and noncancer health impacts to the public resulting from inhalation exposure to diesel PM, this alternative is not a reasonable option.

B. Rely on New Engine Standards

Another alternative would be to rely on existing governmental programs. Beginning in 1996, manufacturers and vendors of diesel engines have been subject to U.S. EPA's nonroad diesel emission regulations (40 CFR Part 89). The standards are tiered and the date upon which each tier takes effect depends on the engine size. As of January 1, 2000, all engine sizes were subject to Tier 1 standards. (SCAQMD, 2003) Recently, the U.S. EPA proposed new engine standards (Tier 4) for nonroad diesel engines that would take effect in 2008 and would include stringent emission standards

for PM, NOx, and SOx, pollutants which contribute to adverse public health impacts. In addition, U.S. EPA's proposed rule would require nonroad diesel engines to use diesel fuel with a maximum sulfur content of 500 ppm in 2007 and 15 ppm in 2010. (EPA, 2003) California has harmonized its new engine standards for off-road diesel engines with the proposed U.S. EPA nonroad standards. While technically these requirements do not extend to "stationary" engines, manufacturers have indicated they generally sell certified off-road engines for stationary use, and the benefits of the nonroad standards could be extended to new stationary CI engines.

However, the U.S. EPA's proposed Tier 4 new engine standards do not address existing in-use diesel engines, and the new standards would be implemented on a phased-in schedule based on engine size beginning in 2008 through 2014. Additionally, the proposed federal standards offer various alternatives to demonstrate (use of emission reduction credits) or delay compliance to a certain phase-in schedules. These critical implementation measures will not produce the greatest potential reductions in diesel PM emissions in the shortest timeframe. Further, the long useful life of diesel engines and the lack of stringent standards for in-use nonroad diesel engines will significantly limit the potential reduction in ambient concentrations of diesel PM and associated cancer and noncancer health risks. ARB staff does not recommend this alternative because it would result in less reduction in diesel PM emissions and greater potential cancer risk than the proposed ATCM.

C. Rely on Local Regulations

In general, local and regional authorities have the primary responsibility for control of air pollution from all sources other than emissions from motor vehicles (H&SC Section 40000). However, H&SC 93113(b) directs the ARB to regulate non-vehicle engines, which include stationary diesel-fueled engines. California air pollution control districts or air quality management districts (air districts) have established two permitting programs that control emissions from new, modified, or existing stationary sources. New or modified stationary sources are subject to federal and or local New Source Review (NSR) permitting requirements for nonattainment pollutants and their precursors. Existing stationary sources that emit nonattainment pollutants or their precursors are also subject to retrofit control requirements based on the best or reasonably available retrofit control technology. Several air districts have source-specific regulations affecting existing stationary diesel engines; however, the majority of them primarily address NOx emissions and typically exempt engines used as emergency standby engines.

Currently, at least eight air districts have adopted toxic NSR rules and many more have adopted toxic NSR permitting policies or procedures. During the development of California's Diesel Risk Reduction Plan, the ARB staff and air districts agreed that the best approach to controlling and reducing the potential adverse health risks from diesel PM is through the development of source-specific ATCMs. In this manner, each activity (e.g., on-road, off-road, marine, agricultural, etc.) would be consistently regulated throughout California, taking into account each activity's uniqueness. Because of the

potential for inconsistent regulation of stationary diesel-fueled engines, reliance on local regulations is not considered a viable option.

D. Mandate 85 Percent Reductions from All Diesel-fueled CI Engines

This alternative considers requiring all diesel-fueled CI engines to achieve a minimum of 85 percent reduction from baseline emissions of diesel PM. The proposed emission reduction goal would be characterized as a performance standard in this regulation; thus, it could be met by a variety of emission control strategies. Costs of implementing this proposal would vary based on the control strategy chosen by each newly regulated source, e.g., singular emission control device, or a combination of control devices, hours of operation, and/or alternative fuels. While the emission benefits would be approximately twice as much as in this proposal, the cost for this alternative would be about four to five times greater. Therefore, this option is not considered feasible due to the high costs and fiscal impact associated with its full implementation.

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VIII. ENVIRONMENTAL IMPACTS

This chapter describes the potential environmental impacts of this proposed ATCM. This proposed ATCM is intended to protect the health of California's citizens by reducing exposure to stationary diesel engine emissions. An additional consideration is the impact that implementation of the proposed ATCM may have on the environment. Based upon available information, the ARB staff has determined that no significant adverse environmental impacts should occur as the result of adopting the proposed ATCM. This chapter describes the potential impacts that the proposed ATCM may have on wastewater treatment, hazardous wasted disposal, and air quality.

A. Legal Requirements

The California Environmental Quality Act (CEQA) and ARB policy require an analysis to determine the potential environmental impacts of proposed regulations. Because the ARB's program involving the adoption of regulations has been certified by the Secretary of Resources pursuant to Public Resources Code section 21080.5, the CEQA environmental analysis requirements may be included in the Initial Statement of Reasons (ISOR) for this rulemaking. In the ISOR, ARB must include a "functionally equivalent" document, rather than adhering to the format described in CEQA of an Initial Study, a Negative Declaration, and an Environmental Impact Report. In addition, staff will respond, in the Final Statement of Reasons for the ATCM, to all significant environmental issues raised by the public during the public review period or at the Board public hearing.

Public Resources Code section 21159 requires that the environmental impact analysis conducted by ARB include the following:

- An analysis of reasonably foreseeable environmental impacts of the methods of compliance;
- An analysis of reasonably foreseeable feasible mitigation measures; and
- An analysis of reasonably foreseeable alternative means of compliance with the ATCM.

Compliance with the proposed ATCM is expected to directly affect air quality and potentially affect other environmental media as well. Our analysis of the reasonable foreseeable environmental impacts of the methods of compliance is presented below.

Regarding mitigation measures, CEQA requires an agency to identify and adopt feasible mitigation measures that would minimize any significant adverse environmental impacts described in the environmental analysis.

The proposed ATCM is needed to reduce the risk from exposures to diesel PM as required by Health and Safety Code (H&SC) section 39666 and to fulfill the goals of the Diesel Risk Reduction Plan. Alternatives to the proposed ATCM have been discussed earlier in Chapter VII of this report. ARB staff have concluded that there are no

alternative means of compliance with the requirements of H&SC section 39666 that would achieve similar diesel PM emission reductions at a lower cost.

B. Effects on Air Quality

The proposed ATCM will provide diesel PM emissions reductions throughout California, especially in urban areas and those areas non-attainment for the State and federal ambient air quality standards for PM_{10} and $PM_{2.5}$. Air quality benefits will result from the reduction of NOx, ROG, and CO emissions as well. The projected controlled emissions from stationary diesel-fueled engines are presented in Table VIII-1.

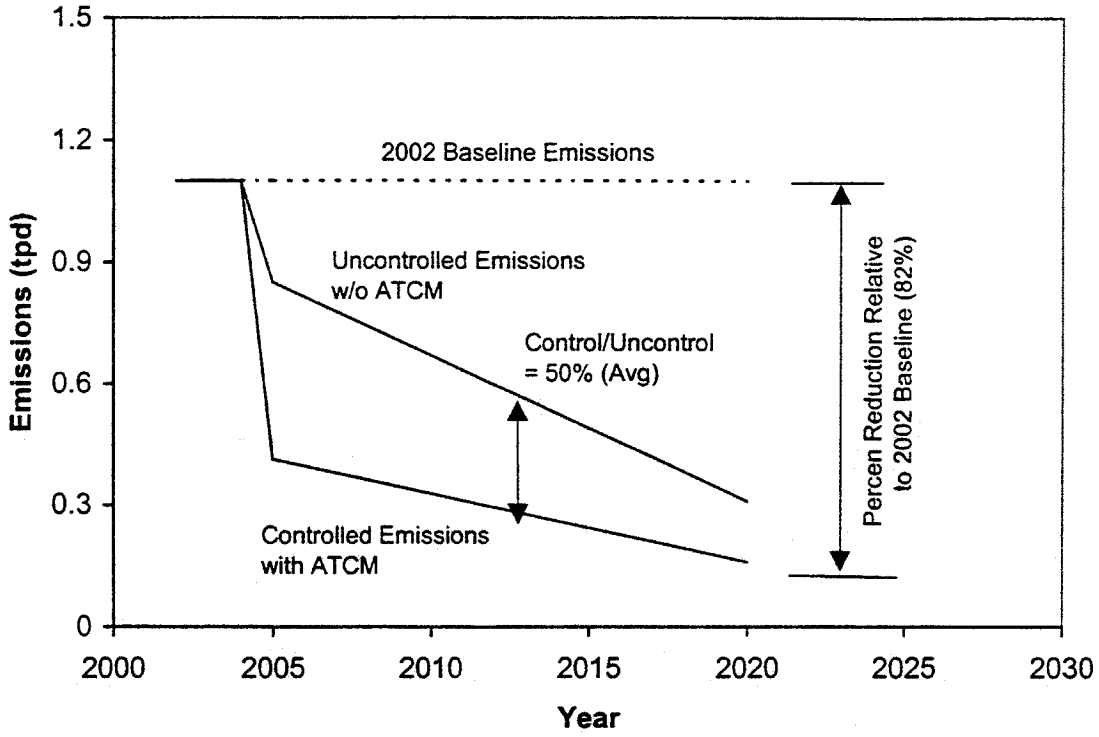
Table VIII-1: Projected Annual Emissions for Stationary Engines Used in Non-Agricultural Applications with Implementation of the Proposed ATCM*

	2002 Emissions (Tons per Day)				2010 Emissions (Tons per Day)				2020 Emissions (Tons per Day)			
Category	**PM**	**NOx**	**ROG**	**CO**	**PM**	**NOx**	**ROG**	**CO**	**PM**	**NOx**	**ROG**	**CO**
Prime	0.8	13.8	1.3	4.8	0.1	8.5	0.5	1.6	0.1	2.9	0.3	1.2
Emergency Standby	0.3	6.4	0.5	2.1	0.2	4.6	0.3	1.4	0.1	2.5	0.2	1.2
Total	1.1	20.2	1.8	6.9	0.3	13.1	0.8	3.0	0.2	5.4	0.5	2.4

* We do not have projected ATCM-impacted emission estimates for agricultural engines at this time.

ARB staff estimates that, with implementation of the proposed ACTM, diesel PM emissions from stationary diesel-fueled non-agricultural engines will be reduced by approximately 0.9 tons per day in 2020, relative to 2002 baseline levels. As shown in figure VIII-1, this is about an 80 percent reduction from the 2002 baseline. Of this, about 50 percent can be attributed to the ATCM.

Figure VIII-1: Projected Diesel PM Emissions with and without the ATCM



Between 2005 and 2020, we estimate approximately 1,710 tons of PM will be removed from California's air as a result of the ATCM. As shown in Table VIII-2, ARB staff estimates that, as older engines are replaced with new engines or retrofitted with DECS, there will also be a reduction in NOx of approximately 790 tons per year (2.2 tons per day) and 106 tons per year (0.3 tons per day) reduction in ROG in the same time frame.

Table VIII-2: Emission Benefits from Implementation of the Proposed ATCM

	PM	NOx	ROG	CO
Emissions Removed 2005 to 2020 (Tons)	1,710	12,640	1,700	6,590
Annual Average Reductions (Tons per Year)	107	790	106	410

Figure VIII-2 illustrates the emissions reductions associated with the implementation of the ATCM for diesel PM and ROG. Figure VIII-3 illustrates the emissions reductions associated with the implementation of the ATCM for NOx and CO.

Figure VIII-2: PM and ROG Emission Reductions Attributable to the ATCM for Non-Agricultural Engines

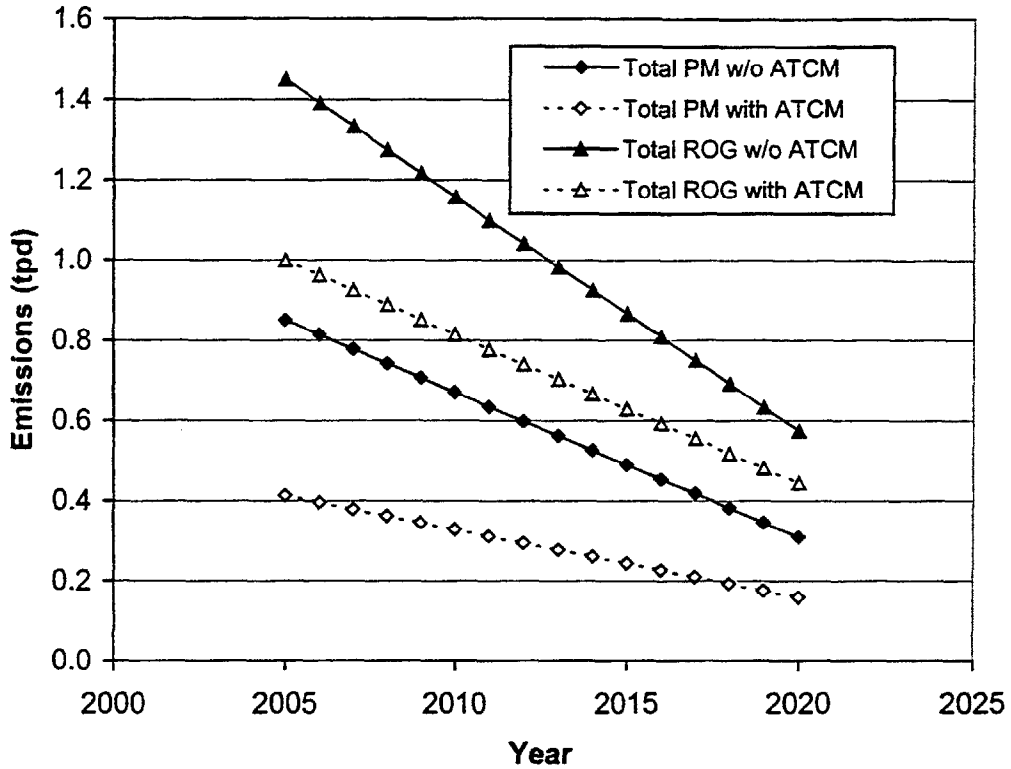
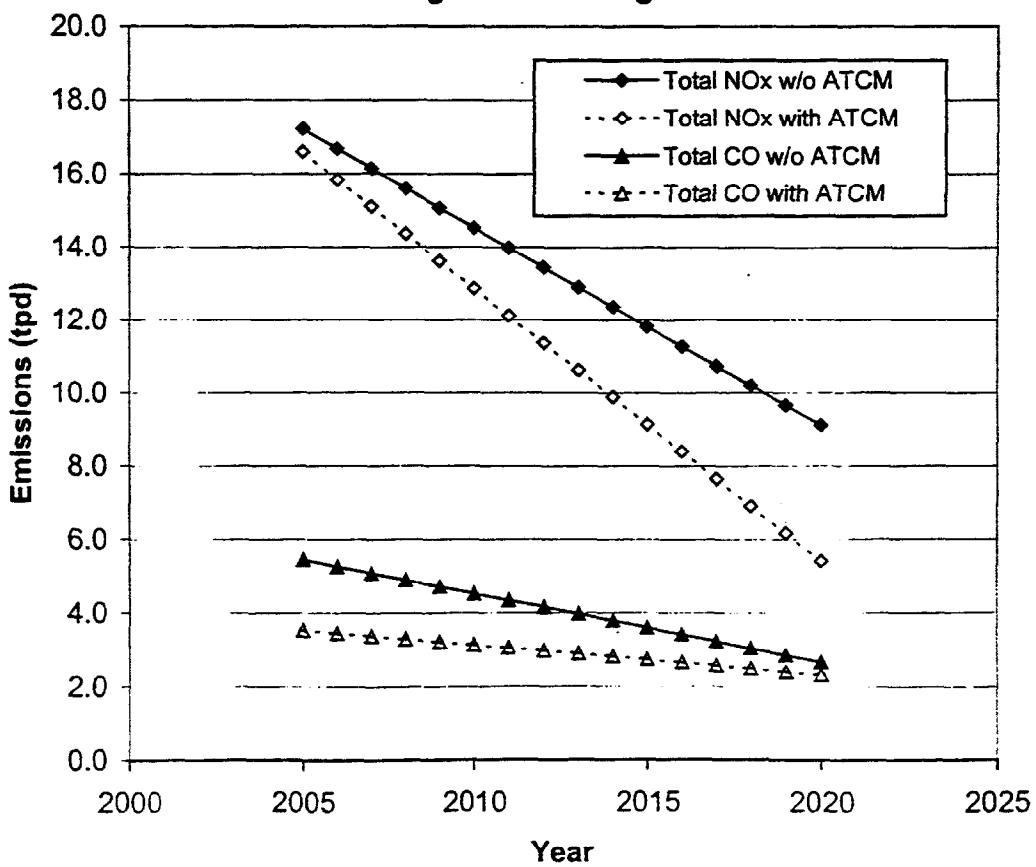


Figure VIII-3: NOx and CO Emission Reductions Attributable to the ATCM for Non-Agricultural Engines



C. Health Benefits of Reductions of Diesel PM Emissions

The emission reductions obtained from this regulation will result in lower ambient PM levels and significant reductions of exposure to primary and secondary diesel PM. Lower ambient PM levels and reduced exposure, in turn, would result in a reduction of the prevalence of the diseases attributed to PM and diesel PM including, reduced incidences of hospitalizations for cardio-respiratory disease, and prevention of premature deaths.

Primary Diesel PM

Lloyd and Cackette estimated that, based on the Krewski *et al.* study[14], diesel $PM_{2.5}$ exposures at level of 1.8 $\mu g/m^3$ resulted in a mean estimate of 1,985 cases of premature deaths per year in California. (Lloyd/Cackette, 2001) The diesel PM emissions corresponding to the direct diesel ambient population-weighted PM concentration of 1.8 $\mu g/m^3$ is 28,000 tons per year. (ARB, 2000) Based on this information, we estimate that reducing 14.11 tons per year of diesel PM emissions would result in one fewer premature death (28,000 tons/1,985 deaths). Comparing the $PM_{2.5}$ emission before and after this regulation, the proposed regulation is expected to reduce emissions by 1,713 tons at the end of year 2020, and therefore prevent an estimated 121 premature deaths (60-185, 95 percent confidence interval (95 CI)) by year 2020. Prior to 2020, cumulatively, it is estimated that 60 premature deaths (29-90, 95 CI) would be avoided by 2010 and 97 (48-146, 95 CI) by 2015.

If we multiply 14.11 tons of diesel PM emissions by the average present value of cost-effectiveness of $7.67 per pound PM (or $15,340 per ton; see Chapter IX) the estimated cost of control per premature death prevented is about $216,447 in 2002 dollars. The U. S. EPA has established $6.3 million (in year 2000 dollars) for a 1990 income level as the mean value of avoiding one death. (EPA, 2003) As real income increases, the value of a life may rise. U.S. EPA further adjusted the $6.3 million value to $8 million (in 2000 dollars) for a 2020 income level. Assuming that real income grew at a constant rate from 1990 and will continue at the same rate to 2020, we adjusted the value of avoiding one death for the income growth. Since the control cost is expressed in 2002 discounted value, accordingly, we discounted values of avoiding a death in the future back to the year 2002. In U.S. EPA's guidance of social discounting, it recommends using both three and seven percent discount rates. (EPA, 2000) Using these rates, and the annual avoided deaths as weights, the weighted average value of reducing a

[14] Although there are two mortality estimates in the report by Lloyd and Cackette – one based on work by Pope *et al.* and the other based on Krewski *et al.*, we selected the estimate based on the Krewski's work. For Krewski *et al.*, an independent team of scientific experts commissioned by the Health Effects Institute conducted an extensive reexamination and reanalysis of the health effect data and studies, including Pope *et al.* The reanalysis resulted in the relative risk being based on changes in mean levels of $PM_{2.5}$, as opposed to the median levels from the original Pope *et al.* study. The Krewski *et al.* reanalysis includes broader geographic areas than the original study (63 cities vs. 50 cities). Further, the U.S. EPA has been using Krewski's study for its regulatory impact analyses since 2000. (Krewski, 2000) (Pope, 1995)

future premature death discounted back to year 2002 is $4.4 million at seven percent discount rate, and $6 million at three percent. The cost per death avoided because of this proposed regulation is 20 to 28 times lower than the U.S. EPA's benchmark for value of avoided death. This rule is, therefore, a cost-effective mechanism to reduce premature deaths that would otherwise be caused by diesel PM emissions without this regulation.

The benefits of reducing diesel emissions are based on a statewide average diesel emission value, such as in the Lloyd and Cackette analysis, which contains off-road emissions from a number of categories that occur well away from population centers. Stationary diesel-fueled engines and their diesel emissions are more concentrated in urban areas, thus a greater reduction of the emissions as a result of the regulation are expected to occur in urban areas, as compared to rural areas. Emission reductions are, therefore, likely to have greater benefits than those estimated by Lloyd and Cackette. Thus, the proposed rule is likely more cost-effective than the above estimate would suggest.

Secondary Diesel PM

Lloyd and Cackette also estimated that indirect diesel $PM_{2.5}$ exposures at a level of 0.81 $\mu g/m^3$ resulted in a mean estimate of 895 additional premature deaths per year in California, above those caused by directly emitted formed diesel PM. The NOx emission levels corresponding to the indirect diesel ambient PM concentration of 0.81 $\mu g/m^3$ is 1,641 tpd (598,965 tpy). Following the same approach as above, we estimate that reducing 669 tons of NOx emissions would result in one fewer premature death (598,965 tons/895 deaths). Therefore, with the 12,645-ton reduction of NOx that is expected by the end of 2020, an estimated 19 deaths would be avoided.

If we multiply 669 tons of NOx emissions by the average present value of cost-effectiveness of $0.75 per pound NOx (or $1,500 per ton, see Chapter IX), the estimated cost of control per premature death prevented is about $1 million. The cost is again lower than the U.S. EPA's present value of an avoided death by four to six times.

Reduced Ambient Ozone Levels

Emissions of NOx and ROG are precursors to the formation of ozone in the lower atmosphere. Exhaust from diesel engines contributes a substantial fraction of ozone precursors in any metropolitan area. Therefore, reductions in NOx and ROG from diesel engines would make a considerable contribution to reducing exposures to ambient ozone. Controlling emissions of ozone precursors would reduce the prevalence of the types of respiratory problems associated with ozone exposure and would reduce hospital admissions and emergency visits for respiratory problems.

D. Reasonably Foreseeable Environmental Impacts as a Result of Potential Compliance Methods

We have identified potential adverse environmental impacts from the use of diesel oxidation catalysts (DOCs) and diesel particulate filters (DPFs). These include a potential increase in sulfate PM, a potential increase in NO_2 from some DPFs, and the potential for creating hazardous wastes. As described below, options are available to mitigate these potential adverse impacts.

Diesel Oxidation Catalyst (DOC)

Two potential adverse environmental impacts of the use of diesel oxidation catalysts have been identified. First, as is the case with most processes that incorporate catalytic oxidation, the formation of sulfates increases at higher temperatures. Depending on the exhaust temperature and sulfur content of the fuel, the increase in sulfate particles may offset the reductions in soluble organic fraction emissions. Using low sulfur diesel fuel can minimize this effect. Second, a diesel oxidation catalyst could be considered a "hazardous waste" at the end of its useful life depending on the materials used in the catalytic coating. Because catalytic converters have been used on gasoline powered on-road vehicles for many years, there is a very well-established market for these items (see, for example, http://www.pacific.recycle.net – an Internet posting of buyers and sellers of various scrap materials). In the recycling process, the converters are broken down, and the metal is added to the scrap-metal stream for recycling, while the catalysts (one or a combination of the platinum group metals) are extracted and reused.

Because of platinum's high activity as an oxidation catalyst, it is the predominant platinum group metal used in the production of diesel oxidation catalysts. There is a very active market for reclaimed platinum for use in new catalytic converters, jewelry, fuel cells, cathode ray tube screens, catalysts used during petroleum refining operations, dental alloys, oxygen sensors, platinum electrode spark plugs, medical equipment, and platinum-based drugs for cancer treatment, to name a few. (Kendall, 2002) (Kendall, 2003)

Catalyzed Diesel Particulate Filters

These devices are composed of a ceramic diesel particulate filter along with a platinum catalyst to catalyze the oxidation of carbon-containing emissions and significantly reduce diesel PM emissions. This is an obvious positive environmental impact.

However, there are also inorganic solid particles present in diesel exhaust, which are captured by diesel particulate filters. These inorganic materials are metals derived from engine oil, diesel fuel, or engine wear and tear. While the PM filter is capable of capturing inorganic materials, these materials are not oxidized into a gaseous form and expelled.

Because these materials would otherwise be released into the air, the filters are benefiting the environment by capturing these metallic particles, known as "ash." However, the ash that is collected in the PM filter must be removed from the filter periodically to maintain the filter's effectiveness.

Ash collected from a diesel engine using a typical lubrication oil and no fuel additives has been analyzed and is primarily composed of oxides of the following elements: calcium, zinc, phosphorus, silicon, sulfur, and iron. Zinc is the element of primary concern because, if present in high enough concentration, it can make a waste a hazardous waste. Title 22, CCR, section 66261.24 establishes two limits for zinc in a waste: 250 milligrams per liter for the Soluble Threshold Limit Concentration and 5,000 milligrams per kilogram for the Total Threshold Limit Concentration. The presence of zinc at or above these levels would cause a sample of ash to be characterized as a hazardous waste.

Under California law, it is the generator's responsibility to determine whether their waste is hazardous or not. Applicable hazardous waste laws are found in the H&SC, division 20; title 22, CCR, division 4.5; and title 40 of the Code of Federal Regulations. Staff recommends owners that install a diesel particulate filter on an engine to contact both the manufacturer of the diesel emission control system and the California Department of Toxic Substances Control (DTSC) for advice on proper waste management.

ARB staff has consulted with personnel of the DTSC regarding management of the ash from diesel particulate filters. DTSC personnel have advised ARB that it has a list of facilities that accept waste from businesses that qualify as a conditionally exempt small quantity generator. Such a business can dispose of a specific quantify of hazardous waste at certain Household Hazardous Waste events, usually for a small fee. An owner who does not know whether or not he qualifies or who needs specific information regarding the identification and acceptable disposal methods for this waste should contact the California DTSC.[15]

Additionally, the technology exists to reclaim zinc from waste. For example, the Swedish company MEAB has developed processes for extracting zinc and cadmium from various effluents and industrial waste streams. Whether reclamation for reuse will be economically beneficial remains to be seen. (MEAB, 2003)

Because of the time and costs associated with filter maintenance, there are also efforts by industry to reduce the amount of ash formed. Most of the ash is formed from the inorganic materials in engine oil, particularly from zinc-containing additives necessary to control acidification of engine oil – due in part to sulfuric acid derived from sulfur in diesel fuel. As the sulfur content of diesel fuel is decreased, the need for acid neutralizing additives in engine oil should also decrease. A number of technical programs are ongoing to determine the impact of changes in oil ash content and other

[15] Information can be obtained from local duty officers and from the DTSC web site at http://www.dtsc.ca.gov.

characteristics of engine oil on exhaust emission control technologies and engine wear and performance.

It may also be possible to reduce the ash level in diesel exhaust by reducing oil consumption from diesel engines. Diesel engine manufacturers over the years have reduced engine oil consumption in order to reduce PM emissions and to reduce operating costs for engine owners. Further improvements in oil consumption may be possible in order to reduce ash accumulation rates in diesel particulate filters.

In addition, measurements of NOx emissions for heavy-duty diesel vehicles equipped with passive catalyzed filters have shown an increase in the NO_2 portion of total NOx emissions, although the total NOx emissions remain approximately the same. In some applications, passive catalyzed filters can promote the conversion of nitrogen oxide (NO) emissions to NO_2 during filter regeneration. More NO_2 is created than is actually being used in the regeneration process; and the excess is emitted. The NO_2 to NOx ratios could range from 20 to 70 percent, depending on factors such as the diesel particulate filter systems, the sulfur level in the diesel fuel, and the duty cycle. (DaMassa, 2002)

Formation of NO_2 is a concern because it irritates the lungs and lowers resistance to respiratory infections. Individuals with respiratory problems, such as asthma, are more susceptible to the effects. In young children, nitrogen dioxide may also impair lung development. In addition, a higher NO_2/NOx ratio in the exhaust could potentially result in higher initial NO2 concentrations in the atmosphere which, in turn, could result in higher ozone concentrations.

Model simulations have shown that a NO_2 to NO_X emission ratio of approximately 20 percent would nearly eliminate any impact of increased NO_2 emissions. (DaMassa, 2002). According to the model, at the NO_2 to NOx ratio of 20 percent, there will be a decrease of the 24-hour ozone exposure (greater than 90 parts per billion) by two percent while an increase of the peak 1-hour NO_2 by six percent (which is still within the NO_2 standard).

The health benefits derived from the use of PM filters are immediate and offset the possible adverse effects of increases in NO_2 emissions. For this reason, a cap of 20 percent NO_2 to NOx emission ratio was established for all diesel emission control systems through ARB's Verification Procedure. ARB staff believes most prime engine operators will choose to install verified systems on their engines. For these engines, the 20 percent NO_2 to NOx emission ratio can be met. There is the potential, however, for the use of systems that exceed the 20 percent cap. Both ARB and the district will monitor this and determine if any additional requirements need to be incorporated into the ATCM.

Alternative Fuels

As discussed in Chapter VI, a number of alternative fuels and alternative diesel fuels show great promise in their potential to reduce diesel PM emissions. These include biodiesel, Fischer-Tropsch fuels, and alternative fuels such as natural gas. No significant negative environmental impacts have been determined from the use of alternative fuels. With respect to alternative diesel fuels, there may be a slight increase in NOx emissions as a result of biodiesel use. (Hofman and Solseng, 2002)

To ensure there are no adverse impacts from the use of alternative diesel fuels, the proposed ATCM requires any alternative diesel-fuel or fuel additives used in a stationary diesel-fueled engine to be verified under the ARB's Verification Procedure. The Verification Procedure permits verification only if a multimedia evaluation of the use of the alternative diesel fuel or additive has been conducted. In addition, verification requires a determination by the California Environmental Policy Council that such use will not cause a significant adverse impact on public health or the environment pursuant to H&SC section 43830.8 (see Public Resource Code, section 71017).

E. Reasonably Foreseeable Mitigation Measures

ARB staff has concluded that no significant adverse environmental impacts should occur from adoption of and compliance with the proposed ATCM. Therefore, no mitigation measures would be necessary.

F. Reasonably Foreseeable Alternative Means of Compliance with the Proposed Airborne Toxic Control Measure

Alternatives to the proposed ATCM are discussed in Chapter VII of this report. ARB staff has concluded that the proposed ATCM provides the most effective and least burdensome approach to reducing children's and the general public's exposure to diesel PM and other air pollutants emitted from diesel-fueled stationary engines.

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IX. ECONOMIC IMPACTS

In this chapter, we present the estimated costs and economic impacts associated with implementation of the proposed ATCM for stationary engines. The expected capital and recurring costs for potential compliance options are presented, as well as an analysis of the cost effectiveness of the ATCM. The cost effectiveness is calculated two ways, as the cost in dollars per pound of diesel PM reduced and also as the cost in dollars per pound of combined ROG + NOx reduced. The costs and associated economic impacts are presented for private companies, as well as governmental agencies.

A. Summary of the Economic Impacts

ARB staff estimates the cost of the ATCM to affected businesses and government agencies to be approximately 47 million dollars for the total capital costs. This corresponds to 8.4 million dollars annually over the useful lift of the control equipment. This cost represents the capital cost of equipment, purchased in 2005 and 2011 using 2002 dollars, annualized over the useful life of the emission control equipment plus the annual recurring costs or savings. ARB does not have data to determine multiple engine ownership and associated engine ages to accurately determine the retrofit phase in schedule. These costs were not brought back to net present value, and the diesel emission control equipment was not phased in over four years. Instead, we assumed the equipment to be purchased at the beginning of the ATCM implementation. This method results in a conservative cost estimate and was used to estimate near term (i.e., 1-3 years) fiscal impacts.

The useful life of the control equipment depends on the number of hours the engine is expected to operate annually. For prime engines, the useful life ranges from 4 to 25 years with a 10-year average. For emergency standby engines, the expected useful life is 25 years.

As shown in Table IX-1, the majority of the costs will be borne by prime engine owners, while in many cases, owners of emergency standby engines will have no cost or net savings due to the reduced operating hours. We estimate that only a small number of emergency standby engines will need to install diesel emission controls (DECS).

Table IX-1: Summary of Annual Costs for the Proposed ATCM

Engine Application	Category	Total Capital Cost	Annualized Capital Cost	Annual Recurring Costs ($)	Total Annualized Cost ($)
Emergency Standby	Private	$2,296,000	$163,000	-$123,000	$40,000
	State	$199,000	$14,000	-$111,000	-$97,000
	City	$370,000	$26,000	-$13,000	$14,000
	County	$192,000	$14,000	-$20,000	-$7,000
	Other Local	$397,000	$28,000	-$71,000	-$43,000
	Federal	$502,000	$36,000	-$22,000	$14,000
Prime	Private	$34,183,000	$5,979,000	$737,000	$6,716,000
	State	$556,000	$98,000	$11,000	$109,000
	City	$2,624,000	$464,000	$53,000	$516,000
	County	$1,330,000	$235,000	$27,000	$262,000
	Other Local	$1,441,000	$255,000	$29,000	$284,000
	Federal	$3,143,000	$556,000	$63,000	$619,000
Total		$47,233,000	$7,868,000	$560,000	$8,427,000

For businesses with a prime engine, the capital cost is expected to be within $14,000 to $173,000. The low end of the range reflects a smaller horsepower engine (e.g.,120 hp) equipped with a diesel particulate filter (DPF). At the upper end, we used a larger engine (e.g.,1500 hp) equipped with a diesel oxidation catalyst (DOC) initially, which is later replaced with a new Tier 4 engine in 2011. The estimated annual ongoing costs are comprised of two parts: (1) a reporting cost of about $100, and (2) a cost ranging from $12 to $2,900 (depending on size and hours of use) for annual maintenance of any DPFs that are used. For example, the costs for a typical prime engine (rated at 590 hp operated 1040 hours per year) with a DPF are about $22,400 for equipment and installation, $100 for reporting, and $550 per year for ash cleaning. The costs for the same engine with a DOC that is later replaced with a Tier 4 engine are about $60,850 ($6,150 in 2005 and $54,700 in 2011), with an annual reporting cost of $100.

For businesses with emergency standby engines, we expect most operators to reduce their annual hours of operation to avoid installation of DECS, which should result in cost savings due to a reduction in the annual diesel fuel usage. For example, an operator with one engine (520 hp) could reduce maintenance and testing usage from 35 to 20 hours, thereby saving about $760 annually. While most operators will likely reduce their hours of operation to meet the ATCM requirements, we estimate that about one percent of operators will need to install a DOC.

Overall, most affected businesses will be able to absorb the costs of the proposed regulation with no significant adverse impacts on their profitability. This finding is based on the staff's analysis of the estimated change in "return on owner's equity" (ROE). The analysis found that the overall change in ROE ranges from negligible to a decline of about six percent. Generally, a decline of more than ten percent in ROE suggests a significant impact on profitability. Because the proposed ATCM would not alter significantly the profitability of most businesses, we do not expect a noticeable change in employment, business creation, elimination, or expansion, and business competitiveness in California. We also found no significant adverse economic impacts on any local or State agencies.

We estimate the overall cost effectiveness of the proposed ATCM to be about $15 per pound of diesel PM reduced, considering only the benefits of reducing diesel PM. Because the proposed ATCM will also reduce reactive organic gases (ROG) and NOx emissions, we allocated half of the costs of compliance against these benefits, resulting in cost effectiveness values of $8/lb of diesel PM and $1/lb of ROG plus NOx reduced.

With regard to mortality benefits, we estimate the cost of avoiding one premature death to be about $216,000 based on attributing half of the cost of controls to reduce diesel PM. Compared to the U.S. EPA's present assignment of $4.4 million as the value of an avoided death, this proposed ATCM is a very cost-effective mechanism for preventing premature deaths caused by diesel PM.

B. Legal Requirements

In this section, we explain the legal requirements that must be satisfied in analyzing the economic impacts of the ATCM.

Section 11346.3 of the Government Code requires State agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulation. The assessment shall include a consideration of the impact of the proposed regulation on California jobs, business expansion, elimination or creation, and the ability of California business to compete with businesses in other states.

Also, State agencies are required to estimate the cost or savings to any State or local agency and school district in accordance with instructions adopted by the Department of Finance (DOF). The estimate shall include any non-discretionary cost or savings to local agencies and the cost or savings in federal funding to the State.

Moreover, Health and Safety Code section 43013(c) prohibits regulatory actions affecting nonvehicle engines (e.g., stationary diesel engines) used in agricultural operations unless the ARB determines that the standards and other requirements in the ATCM are necessary, cost-effective, and technologically feasible for such engines.

Finally, Health and Safety Code section 57005 requires the Air Resources Board to perform an economic impact analysis of submitted alternatives to a proposed regulation before adopting any major regulation. A major regulation is defined as a regulation that will have a potential cost to California business enterprises in an amount exceeding ten million dollars in any single year. Because the estimated cost of the ATCM does not exceed 10 million dollars in a single year, the proposed ATCM is not a major regulation.

The following is a description of the methodology used to estimate costs as well as ARB staff's analysis of the economic impacts on California businesses and State and local agencies.

C. Methodology for Estimating Costs Associated with Implementation

In this section, we describe how we estimated the number and types of engines and the costs of bringing these engines into compliance with the proposed ATCM. We separately analyzed the costs on new prime engines, new emergency standby engines, existing (in-use) prime engines, and existing (in-use) emergency standby engines. The basic methodology in this section is used in subsequent sections of the report to analyze the costs to private companies and governmental agencies.

Businesses and federal, State, and local public agencies with stationary diesel-fueled engines in California will incur compliance costs as discussed below, to the extent that they have engines that must meet the performance standards in the regulation. Examples of these businesses and public agencies include hospitals, schools and universities, telecommunications providers, oil refineries, power generation facilities, banks, hotels/motels, retail stores, correctional facilities, military installations, waste and recycling facilities. The compliance costs will vary depending on the number and operating parameters of the stationary engines operated and the approach taken to comply with the proposed ATCM.

Surveys of Engine Population

To assist in evaluating the cost impacts from the proposed ATCM, ARB staff conducted two surveys (ARB Survey) of businesses and public agencies that operate stationary engines. As described in Chapter III, the ARB Survey collected data on the number, type, application, and ownership for emergency standby and prime stationary engines operated in California. The engine population and operating characteristics reported in the ARB Survey was assumed to be representative of the total engine population subject to the ATCM. The cost analysis was performed on the population of engines reported in the ARB Survey and scaled to the total number of engines in the emissions inventory to determine the total costs of the proposed ATCM. The level of control needed to demonstrate compliance with the ATCM was based on the horsepower, age, emission rate, and hours of operation for each engine reported in the ARB Survey.

Based on the survey results, the ARB staff estimates approximately 4,280 private companies having an estimated 9,900 emergency standby engines and 1,040 prime

engines will be subject to this regulation. Approximately 6.5 percent (280) of the estimated total number of businesses could be considered small businesses based on annual gross receipts of $10,000,0000 or less (per California Government Code Section 14837(d)(1)). Federal, State, and local public agencies will also be affected by the ATCM. Based on the ARB Survey, ARB staff estimates there are approximately 280 prime engines and 9,900 emergency standby engines operated by public agencies.

Capital and Recurring Costs

The cost evaluation considers both capital and on-going or recurring operating costs. Capital costs include equipment purchase, installation (i.e., piping, insulation, electrical, foundations and supports, engineering design, start-up), emissions testing and permit modification costs. The capital investment costs for purchase and installation of DECS were determined from actual costs of installing DECS on stationary diesel-fueled engines in California over the last 2-4 years (see Appendix I). A simple linear regression was used to project the costs to other engines based on their horsepower size. Based on this analysis, we estimate the cost to install a diesel particulate filter at $38 per horsepower, a diesel oxidation catalyst at $10.40 per horsepower, and a new engine at $92.65 per horsepower.

Other capital costs associated with compliance with the ATCM are emissions testing ($5,000 to $17,000 per source test), installation of hour meters ($25 per meter), and for modifications to existing permits ($1,000 when control equipment is installed and $124 when only the operating hours are adjusted). With respect to emissions testing, ARB staff believes that many engine owners will have access to data on expected engine emission rates for engines with model years 1988 and newer from the engine manufacturer. To be conservative, ARB staff assumed 50 percent of the prime engine population may need additional source testing to establish either baseline or after control PM emission rates.

Most diesel engines have an hour meter as standard equipment; however, there may be some engines that will need to install an hour meter to comply with the ATCM. If an hour meter is needed, the cost of purchase and installation of an hour meter is fairly minor. A quartz hour meter can be purchased for $25.00. The hour meter may also be useful to properly maintain the engine and thus save the owner/operator money. ARB staff assumed about 5 percent of the engines would need to install a hour meter.

Operating or recurring costs include expenditures for recordkeeping and reporting, periodic maintenance of DECS, and incremental fuel costs. We assumed annual costs of $100 per emergency standby stationary engine for owners to assemble the data and report to the district when required. ARB staff believes this is a conservative assumption since many companies already keep these records or have set schedules that allow readily-calculated annual maintenance and testing hours. In most all cases, prime stationary engines are already required by permit to maintain records on hours of operation. Therefore, we attributed no additional costs for recordkeeping for prime engines.

Maintenance costs include the removal of ash from DPFs; removal of ash is not an issue with DOCs. Based on discussions with manufacturers of DPFs, ARB staff estimated the cost for DPF maintenance (ash removal and disposal) to be about $1.33 per horsepower for every 1,500 hours of operation.

Fuel costs may be lower under the ATCM in cases where operators of emergency standby engines choose to reduce annual operation to avoid the need to install a DECS. In these cases, the proposed ATCM will likely result in cost savings. Another factor that was considered is the slightly higher fuel cost for engines with diesel particulate filters or oxidation catalysts that require the use of low sulfur diesel fuel (less than 15 ppm sulfur) prior to July 1, 2006. After July 1, 2006, this added cost should disappear, because the recently amended California diesel fuel regulations mandate the use of low sulfur fuel for all on-and off-road diesel vehicles and stationary engines, resulting in widespread availability of the fuel.

ARB staff performed the cost analysis relative to the year 2002 (current value of the control costs), and unless otherwise stated, all costs are given in 2002 dollars. Using an annual discount rate of seven percent with an inflation rate of two percent, ARB staff determined annual costs over the life of the DECS (25 years assumed for emergency backup engines, 10 years for prime engines). Where future costs are mentioned in the cost effectiveness and mortality sections, they have been adjusted to 2002 dollars using well-established economic principles.

All cost estimates are based on currently available technology as described below; staff believes it is likely that the costs will decrease as technology improves and production and sales volumes increase. Additional details on the cost analysis can be found in Appendix I.

D. Potential Compliance Options and Related Capital and Recurring Costs

The costs associated with compliance will vary depending on whether: (1) the engine must meet the requirements for a new engine or an in-use engine and (2) if the engine is a prime engine or an emergency stand-by engine. Briefly summarized below is a discussion of the potential compliance options for typical prime and emergency standby engines, the estimated capital and recurring costs associated with each compliance, and the assumptions used in the cost analysis. Tables IX-2 and IX-3 provide a summary of the major assumptions used in these analyses.

New Prime Engines

For new prime engines, the ATCM requires the engine to meet a PM emissions rate of 0.01g/bhp-hr. Because 0.01 g/bhp-hr engines are not expected to be available "off the shelf" until 2011, new engine purchasers would need to buy engines that are certified to 0.15 g/bhp-hr or less and install a diesel particulate filter (DPF) on the engine to lower the emissions to 0.01 g/bhp-hr. Beginning in 2011, U.S. EPA is expected to require

new engines to meet the 0.01 g/bhp-hr emissions level. (see U.S. EPA's proposed rulemaking on the "*Control of Emissions of Air Pollution from Nonroad Diesel Engines and Fuel*," as published in the Federal Register (68 FR 28328, May 23, 2003)).

We assumed the capital costs attributable to the ATCM are the costs of purchase and installation of the DPF on new engines put into service prior to 2011. Additional costs include emissions testing for half the engines, incremental fuel costs associated with the purchase of low sulfur fuel in 2005, and reporting and recordkeeping as discussed below. No permit costs were assumed because a new engine would require a permit regardless of whether the ATCM were in place or not. We assumed no additional cost due to the ATCM beginning in 2011, since U.S. EPA is expected to require manufacturers to produce engines to meet the standards in the ATCM.

New Emergency Standby Engines and New Agricultural Engines

The ATCM requires new emergency standby engines and any new agricultural engine to meet PM emissions standards of 0.15 g/bhp-hr in 2005. As discussed in Appendix F, Basis for the Diesel PM Standards, there are engines in all horsepower ranges greater than 50 hp that can be purchased off the shelf at this emission limit. Therefore, we assumed there will be no capital costs attributable to the ATCM for this category of engines.

However, we did account for the costs of annual recordkeeping and reporting of hours of operation required for owners of non-agricultural emergency standby engines. For agricultural engines, the ATCM requires sellers of stationary agricultural engines to report annual sales. In the cost analysis, ARB staff assumed annual costs of $100 per distributor to assemble the data and report to the district when required. It was assumed there were 20 distributors.

In-Use Prime Engines

Certified existing prime engines (generally engines manufactured in 1996 or later) are required to either reduce diesel PM emissions by at least 85 percent or meet an emissions standard of 0.01g/bhp-hr in the 2005-2009 timeframe. In most cases, we expect that engine operators will choose to retrofit their engine with emission control technology to reduce diesel PM emissions by 85 percent. Based on the current availability of emission control technologies for diesel engines, we expect most operators to install a diesel particulate filter, for which the associated capital costs are summarized in Table IX-2.

For non-certified engines, where it is not possible to install a DPF due to technical issues, the proposed ATCM allows for installation of a DOC in 2005, followed by replacement of the engine with a new Tier 4 engine in the 2011-2013 timeframe. The capital costs in this case include the cost for the DOC and the purchase of a new engine in 2011. We assumed approximately 10% of the engines would have been at the end of

their useful life in 2011 and did not attribute any new engine costs for these engines to the ATCM. Additional costs include annual maintenance costs associated with DECS.

We estimate that retrofitted DECS will last for 8400 hours of use (twice the typical warranty period required by the Verification Procedure). This is based on our assumption that prime engines run an average of 1040 hours a year, with a range of 70 to 2200 hours per year (Diesel Risk Reduction Plan, October 2000). DECS installed on these engines could last from 4 to 25 years. To be conservative, staff assigned 10 years as the average useful life of DECS installed on prime engines based on the population weighted useful life.

In-Use Emergency Standby Engines

There are a wide variety of compliance options available for in-use emergency standby engines, depending on the hours of operation needed for maintenance and testing and the emission rate of the engine. Because the ATCM proposes increasingly more stringent performance standards with increasing hours of operation for maintenance and testing, we expect that many operators will comply with the requirements by adjusting their hours for maintenance and testing to a level where additional controls are unnecessary. This compliance option will potentially result in net savings to the operator due to reduced annual fuel consumption.

ARB staff believes that the majority of owners of emergency standby engines will be able to limit the hours for maintenance and testing and avoid installing DECS. However, in some cases, an engine with a lower emissions rate will require the installation of an oxidation catalyst to allow routine maintenance and testing. In other situations, particularly for engines emitting more than 0.15 g/bhp-hr that require over 30 hours a year for maintenance and testing, the owner may need to install a diesel particulate filter or some other highly effective emission control device.

We estimate that DECS will last for 8,400 hours of use (twice the typical warranty period). Because emergency standby stationary engines run on average 30 hours a year (ARB Survey), DECS installed on these engines could last much more than 25 years. To be conservative, staff limited the DECS useful life to 25 years.

Stationary Engines ≤50 hp

For new stationary engines rated at or below 50 horsepower, the ATCM requires compliance with the current model Off-Road Compression-Ignition Engine Standards (title 13, CCR, section 2423). Because these engines are widely available and required for use in off-road mobile or portable applications, we assumed no capital costs attributable to the ATCM.

Table IX-2 summarizes the estimated capital, operation and maintenance, reporting, and recordkeeping costs associated with the compliance options. In Table IX-3, the key cost assumptions used in the cost analysis are provided.

Table IX-2: Estimated Capital, Operation, and Maintenance Costs for Compliance with the Proposed ATCM

Compliance Option	DPF	DOC	New Engine	Reduce Hours or No Additional Controls Necessary
Capital Costs				
Equipment & Installation	$38/hp	$10.40/hp	$92.65/hp	0
Hour Meter	$25	$25	0	0
On-Going Costs / Operation and Maintenance				
Cleaning	$1.33 per hp for every 1,500 hours of operation	0	0	0
Current Diesel Fuel Cost	$1.74/gal	$1.74/gal	$1.74/gal	$1.74/gal
Incremental Fuel Cost (2005)[1]	$0.15/gal	$0.15/gal	$0.15/gal	0
Reporting/ Record-keeping/Compliance				
Reporting and Record-keeping of Hours	$100/year-engine	$100/year-engine	$100/year-engine	$100/year-engine
District Permits[2] Emergency	$1,000	$1,000	$1,000	$124
District Permits[2] Prime	$1,000	$1,000	$1,000	N/A
Emissions Testing[3]	$5,000 -$17,000	$5,000 - $17,000	0	0

1. After July 1, 2006, California diesel fuel regulations mandate the use of low sulfur fuel (15 ppm sulfur) for on and off-road motor vehicles and stationary engines. We assumed this fuel would be available for stationary use as of the same date.
2. Local district permit costs vary widely depending on the district, the size of the engine, and the permit modification. Costs ranged from less than $100 to over $2,000. We assumed an average of $1,000 per permit modification for the cost analysis. For emergency standby engines that only adjust the hours of annual operation to comply with the ATCM, we assumed a lower permit fee of $124 to reflect the expected minimal engineering analysis that would need to be conducted to change the permit conditions.
3. We estimated the costs for emission testing to range from $5,000 to $17,000. The low end represents a single mode test in triplicate and the upper end a 3-mode test done in triplicate. To be conservative, for our cost estimate we assumed the higher costs. We believe, however, that in many cases, there will be alternative data available that can be used in lieu of emission testing (e.g., manufacturers' certification data).

Table IX-3 outlines the cost assumptions used in the cost analysis for the various engine categories affected by this ATCM.

Table IX-3: Key Cost Assumptions Used in the Cost Analysis

Category	Assumptions
New Prime	• New engines must install DPF between 2005-2011 • DPFs effective for twice the 4200 warranty hours (8400) or 25 years, which ever comes first • Off-the-shelf engines available in 2011 and no capital costs attributed to the ATCM after that date • 5 new prime engines/year • Additional cost for low sulfur fuel in 2005 only
New Emergency Standby/New Agricultural Engines	• Off-the-shelf engines that meet the emissions limit available concurrent with ATCM implementation • Approximately 200 new engines each year (½ ag and ½ non-ag) • No capital cost attributed to the ATCM
In-Use Prime	• 80 percent of engines install DPF • 20 percent of engines initially install a DOC and later replaced with new Tier 4 engine in 2011 – Costs assume that 10% would need a new engine anyway • DPFs and DOCs effective for twice the 4200 warranty hours (8400) or 25 years, which ever comes first • Expected life of the DECS averages 10 years (range from 4 to 25) • Discount Rate: 7%, Inflation Rate: 2% • 5% of engines of engines installing a DPF may need to install hour meters because of the ATCM requirement
In-Use Emergency Standby	• 90% of older engines operating over 20 hours per year will reduce hours of operation to below 20 hours per year and avoid controls • Engines capped at 30 hours per year. • Additional cost for low sulfur fuel in 2005 only for those engines with DPFs • 5% of engines need to install hour meters because of the ATCM requirement • DPFs and DOCs effective for twice the 4200 warranty hours or 25 years, which ever comes first • Expected life of the DECS averages 25 years • Discount Rate: 7%, Inflation Rate: 2%
All Engines	• Total capital costs are annualized over the lifetime of the DECS using an annual 7% discount rate and 2% inflation rate • The annual costs are the sum of the annualized capital costs and the annual maintenance and operation costs. • The ARB Survey data is representative of the current California stationary engine population

E. Estimated Costs to Businesses

Here, we estimate the costs and economic impacts on businesses. The analysis estimates the overall total statewide cost to businesses and the total costs to different sectors of the industry. We also estimate the overall impact on business competitiveness, employment, and other business impacts as required by state law.

We estimate the statewide total costs to businesses to be approximately $36.5 million dollars, which equates to annualized costs of about $6.8 million per year. The total statewide cost to businesses is derived from the combined capital and installation costs, using 2002 capital cost values, and equipment lifetime operating and maintenance costs associated with compliance with the regulation. We evaluated the costs for both in-use and new, and prime and emergency standby, stationary diesel-fueled CI engines.

Using the available information from the ARB Survey on the engine population and current in-use and expected PM emission rates, staff determined the percent of engines that would potentially incur capital costs (either from installing a DECS or purchasing a new engine) when complying with the proposed regulation. As shown in Table IX-4, for California businesses, approximately 1,200 engines may require some type of DECS emission control system to meet the performance standards proposed in the regulation.

Table IX-4: Estimated Number of Privately Owned Stationary Diesel-Fueled CI Engines in California Potentially Requiring Installation of Diesel Emission Control Systems

Engine Application		Emission Control Systems			
Emergency Standby	Model Year	Diesel Particulate Filter	Diesel Oxidation Catalyst	New Tier 4 Engine in 2011	None Needed
	1988 – 2002	0	0		6,420
	Pre 1988	0	167		3,330
Prime	All	835	209	209	0

The total statewide costs to businesses were then estimated by adding the 2002 value of the capital costs and operating and maintenance costs for the life of the equipment. For both emergency and non-agricultural prime engines, the total capital cost was estimated to be $36.5 million with an annualized cost of $6.8 million. A summary of the expected costs is presented in Table IX-5.

Table IX-5: Estimated Statewide Costs for Businesses

Equipment		Total Capital Cost ($)	Annualized Capital Cost ($)	Annual Recurring Costs / Savings ($)	Total Annualized Cost ($)
In-use	Prime	$ 33,653,000	$ 5,966,000	$ 674,000	$ 6,640,000
	E/S	$ 2,296,000	$ 163,000	$ -130,000	$ 32,800
New	Prime	$ 530,000	$ 75,000	$ 400	$ 75,800
	E/S	0	0	$ 7,400	$ 7,400
Total		$ 36,479,000	$ 6,204,000	$ 551,800	$ 6,755,000

Costs to a Typical Business

Most business in California do not own any diesel-fueled stationary engines. For those businesses that do have engines, the cost will vary depending on the number of engines operated and the engine activity and operating parameters. To provide some perspective on the costs that may be incurred by a business, ARB staff estimated the costs to comply with the ATCM for a typical business with one engine. For prime engines, we used the average horsepower for prime engines reported in the emissions inventory (590 hp), and for emergency standby engines we used the average horsepower of the engines reported in the ARB Survey (700 hp). As shown in Table IX-6, most businesses that own an emergency standby diesel-fueled engine will not need to install DECS, and for those that do, the majority can use the less expensive diesel oxidation catalyst. If a business owns a prime diesel-fueled engine, then retrofit with a DPF or DOC is necessary.

Table IX-6: Estimated Costs per Engine for a Typical Business

Category	Activity	% of all Private Engines	Typical Engine Size (hp)	Capital Cost per Engine	Annualized Capital Costs	Recurring Costs	Total Annual Costs ($)
Emergency Standby	Reduce Hours	88.8%	700	$100	$0	$100	$100
	DOC	1.5%	700	$7,280	$517	$100	$617
Prime	DPF	7.7%	590	$22,420	$2,903	$550	$3,453
	DOC and	1.9%	590	$6,136	$1,417	$0	$1,417
	Replace in 2011			$54,664	$3,879	$0	$3,879

The estimated capital cost to a business with a typical size emergency standby engine could range from $100 to $7,280 per engine. The low end of the cost range reflects reporting costs for businesses that will not have to install a DECS (no equipment cost). The upper end reflects businesses that will retrofit emergency standby engines with DOCs at an average capital cost of $7,280 each. The estimated capital cost to a typical business with a prime engine is $22,400 for the installation of a DPF. For those

businesses with prime engines needing to install a DOC and then later replacing that engine with a new Tier IV engine in 2011, the estimated capital cost is $60,800 ($6,136 for DOC + $54,664 for new engine). For engines with a DPF, there will be an additional annual cost of approximately $550 for maintenance.

Based on the ARB Survey, for those businesses that do have either emergency standby or prime stationary diesel-fueled engines, the average business owns 2.5 emergency standby engines of 700 horsepower, and three prime engines of 590 horsepower.[16] The typical small business that owns an emergency standby engine has 1.5 emergency standby engines. The typical small business owning prime engines has 1.75 prime engines. The costs for typical businesses and typical small businesses can be estimated by multiplying the cost per engine values, present in Table IX-6 above, by the typical number of engine per business. Additional information on the impacts to businesses can be found in Appendix I.

Costs and Impacts to Various Industry Sectors

ARB staff categorized the emergency standby stationary diesel-fueled engines owned by businesses and reported in the ARB Survey into nine categories. These categories are hospitals, power generation, telecommunications, broadcasting, hotels, petroleum refiners, food processing, and private other. The category 'private other' is made up of a wide variety of businesses or agencies that do not fit within the other categories. Some examples of 'private other' engines include malls, mail-order retailers, retirement homes, condominiums, corporate headquarters, parcel delivery hubs, freight, research facilities, ports, airports, manfacturing, mining, financial, mills, pharmaceutical companies, ski resorts, aquariums, and museums. Because prime engines were reported by a very diverse range of businesees, we did not try to subcategorize these engines.

The methodology used to estimate the costs in Table IX-7 is the same as that used to estimate the total statewide costs of the ATCM in Section D, except that the individual industry sectors were analyzed separately. The industry sectors are derived from the businesses responding to our survey. Based on the information in the ARB survey and applying the assumptions outlined in Table IX-3, there were actual cost savings to the telecommunication industry due to the reduction in the annual hours of operation for maintenance and testing of emergency standby engines.

[16] We believe this may be an overestimate of the number of engines owned by a typical business. Some of the telecommunication businesses own hundreds of engines, which may have biased the average.

Table IX-7: Distribution of Total Costs by Businesses Category

Business Category	Estimated Total Capital Costs	Annualized Capital Cost	Annual Recurring Costs ($)	Total Annualized Cost ($)
Emergency Standby Applications				
Hospitals	$ 200,916	$ 14,255	$ 4,628	$ 18,884
Power Generation	$ 74,810	$ 5,942	$ - 2,769	$ 4,957
Telecommunications	$ 155,710	$ 11,555	$ - 12,418	$ 2,607
Broadcasting	$ 95,850	$ 7,296	$ - 4,625	$ 2,671
Hotels	$ 101,830	$ 8,239	$ - 50	$ 10,662
Petroleum Refiners	$ 97,160	$ 7,845	$ - 3,025	$ 4,820
Food Processing	$ 62,200	$ 5,174	$ - 1,570	$ 3,604
Other[2]	$ 741,850	$ 57,138	$ - 44,970	$ 12,168
Prime Applications				
Prime [3]	$ 36,797,505	$ 6,040,991	$ 674,483	$ 6,715,474
Total	$ 38,327,831	$ 6,158,436	$ 609,684	$ 6,775,846

1. We are assuming that all hospitals and health care facilities will reduce maintenance and testing to less than 20 hours a year pending legislative approval of AB 390. The 458,887 is the estimated reporting and recordkeeping costs for a 25 year period.
2. Examples " other" business types using emergency standby engines include but are not limited to the following: retail, office buildings/property management, airports, ski resorts, and factories.
3. The use of prime engines was not easily categorized by business type. A wide variety of business types use prime engines including: private waste and sanitation facilities, power generation, food processing, petroleum refiners, construction, sand and gravel facilities, shipyard, mountain resorts, recycling, landfill, and composting facilities.

Potential Business Impacts

In this section, we analyze the potential impacts of the estimated costs of the proposed ATCM on business enterprises in. Section 11346.3 of the Government Code requires that, in proposing to adopt or amend any administrative regulation, state agencies shall assess the potential for adverse economic impact on California business enterprises and individuals. The assessment shall include a consideration of the impact of the proposed or amended regulation on the ability of California businesses to compete with businesses in other states, the impact on California jobs, and the impact on California business expansion, elimination, or creation.

This analysis is based on a comparison of the annual return on owner's equity (ROE) for affected businesses before and after the inclusion of the equipment costs, associated recurring costs, and fees. The analysis also uses publicly available information to assess the impacts on competitiveness, jobs, and business expansion, elimination, or creation.

ARB staff does not have access to financial records for most of the privately-owned companies that responded to the ARB Survey. However, the small business status of the survey respondents was determined by including a query on the ARB Survey for the respondent to indicate if their business was a small business (annual gross receipts of $10,000,000 or less per Government Code section 14837 (d)(1)). Based on the ARB Survey responses, staff identified approximately 6.5 percent of the businesses (~280 statewide) as small businesses. These small businesses account for 3.7 percent of the emergency standby engines owned by California businesses (~354 engines statewide). The ARB Survey responses also indicate 38 percent of the businesses that own prime engines are would qualify as small businesses, representing 26 percent of the prime engines.

The types of businesses that may be impacted include private schools and universities, private water treatment facilities, hospitals, office buildings, power generation, communications, broadcasting, building owners, banks, hotel/motels, refiners, resorts, recycling centers, quarries, wineries, dairies, food producing and packaging, manufacturing, landfills, and retail stores. Based on the ARB Survey, staff estimates approximately 4,280 companies, having an estimated 9,900 emergency standby stationary engines and 1,040 prime engines, will be affected by this regulation. The vast majority of the engines requiring a retrofit or replacement are prime engines. The affected businesses fall into different industry classifications, as shown in Table IX-8.

Table IX-8: List of Industries with Affected Businesses

SIC Code	Industry
0723	Agricultural Services
1311	Crude Petroleum And Natural Gas
1389	Oil and Gas Field Services
1429	Crushed and Broken Stone
1442	Construction Sand And Gravel
1542	General Contractors-Nonresidential Buildings, Other Than Industrial
2048	Prepared Feeds and Feed Ingredients for Animals and Fowls
2421	Sawmills and Planing Mills, General
2951	Asphalt Paving Mixtures and Blocks
3272	Concrete Products, Except Block and Brick
3273	Ready-Mixed Concrete
3479	Coating, Engraving, and Allied Services
3711	Motor Vehicles and Passenger Car Bodies
3731	Ship Building and Repairing
4491	Marine Cargo Handling
4581	Airports, Flying Fields, and Airport Terminal Services
4911	Electric Services
4931	Electric & Other Services Comb
4953	Refuse Systems
5093	Scrap and Waste Materials
5932	Used Merchandise Stores
6531	Real Estate Agents and Managers
7353	Heavy Construction Equipment Rental and Leasing
7699	Repair Shops and Related Services, Not Elsewhere Classified

The approach used in evaluating the potential economic impact of the proposed ATCM on California businesses is as follows:

(1) All affected businesses are identified from responses to the ARB surveys. Standard Industrial Classification (SIC) codes identified by these businesses are listed in Table IX-8 above.

(2) Annual costs for the ATCM are estimated for each of these businesses based on the assumptions previously discussed.

(3) The total annual cost for each business is adjusted for both federal and states taxes.

(4) These adjusted costs are subtracted from net profit data and the results used to calculate the Return on Owners' Equity (ROE). The resulting ROE is then compared with the ROE before the subtraction of the adjusted costs to determine the impact on

the profitability of the businesses. A reduction of more than 10 percent in profitability is considered to indicate a potential for significant adverse economic impacts. This threshold is consistent with the thresholds used by the U.S. EPA and others.

Using Dun and Bradstreet financial data from 1999 to 2001, staff calculated the ROEs, both before and after the subtraction of the adjusted annual costs, for the typical businesses from each industry category. These calculations were based on the following assumptions.

- All affected businesses are subject to federal and state tax rates of 35 percent and 9.3 percent, respectively.
- Affected businesses neither increases the prices of their products nor lowers their costs of doing business through cost-cutting measures because of the ATCM.

These assumptions, though reasonable, might not be applicable to all affected businesses.

California businesses are affected by the proposed annual cost of the ATCM to the extent that the implementation of the proposed ATCM reduces their profitability. Using ROE to measure profitability, we found that the ROE range for typical businesses from all industry categories would have declined by about 0.01 to 6 percent in 2006. This represents a small decline in the average profitability of the affected businesses. Overall, most affected businesses will be able to absorb the costs of the proposed ATCM with no significant impacts on their profitability.

Potential Impact on Business Competitiveness

The proposed ATCM may affect the ability of some California businesses that sell their products nationally to compete with businesses outside the State due to the slight increase in stationary diesel-fueled engine costs. However, most businesses affected by this proposed regulation compete in local markets and are not subject to competition from businesses located outside the State.

Emergency standby diesel-fueled engines are located in a wide variety of businesses. However, ARB staff estimates that only one percent of the emergency engines will require modifications that will result in costs to the engine owners. For owners of prime engines, we expect approximately 80 percent to install a DPF and 20 percent to install a DOC with the intent to replace with a new engine in 2011. Most of the affected businesses are large and are expected to be able to absorb the increased costs associated with the proposed ATCM with no significant impact on their ability to compete with non-California businesses (see analysis in Appendix I).

Potential Impact on Employment, Business Creation, Elimination or Expansion

The proposed ATCM is expected to have no noticeable impacts on employment and business' status. Businesses that manufacture, sell, install, repair, or clean diesel particulate emission control systems may experience an increase in demand for their products or services, resulting in an expansion of those businesses or the creation of new businesses. Staff believes used engine dealers would not be eliminated; instead, we believe the dealers would adapt to incorporate additional refurbishment and upgrading of the engines for resale.

ARB staff believes jobs will not be eliminated as a result of the ATCM, but it may lead to the augmentation or alteration of job duties, leading to no net result change in the number of jobs. For example, a mechanic who previously worked on muffler installation would now be installing a DECS. Staff believes additional training and emissions testing may be required for these additional duties, if not provided by the DECS manufacturers. To the extent that DECS are manufactured in California, some jobs may also be created. Some jobs will be created to install, repair, or clean DECS.

F. Potential Costs to Local, State, and Federal Agencies

In this section, we estimate the total costs to governmental agencies. The analysis also estimates the total costs to local, state, and federal agencies individually. As shown in Table IX-9, ARB staff estimates the total costs to public agencies to be approximately 8.1 million dollars, with annualized costs of approximately $1.7 million.

Table IX-9: Summary of Total Lifetime and Annualized Costs for Public Agency Compliance with the ATCM

Engine Application	Category	Total Capital Cost ($)	Annualized Capital Cost ($)	Annual Recurring Costs ($)	Total Annualized Cost ($)
Emergency Standby	State	$198,870	$14,110	-$110,820	-$96,710
	City	$370,000	$26,235	-$12,625	$13,610
	County	$191,850	$13,610	-$20,450	-$6,840
	Other Local	$396,590	$28,142	-$71,302	-$43,160
	Federal	$502,060	$35,624	-$22,084	$13,540
Prime	State	$555,892	$98,266	$11,135	$109,400
	City	$2,624,238	$463,897	$52,563	$516,460
	County	$1,330,292	$235,164	$26,646	$261,810
	Other Local	$1,441,043	$254,736	$28,864	$283,600
	Federal	$3,142,928	$555,587	$62,953	$618,540
Total		$10,753,762	$1,725,371	-$55,121	$1,670,250

Local Public Agencies

The majority of local governments provide services requiring the use of emergency engines to insure public safety or maintain essential services during emergencies. Examples include police departments, jails, fire departments, government data storage facilities, and sewage and water treatment facilities. In the event of power outages, floods or other emergencies, the emergency standby engines prevent disruptions in critical operations.

Based on the ARB Survey and the most current stationary engine emissions inventory, we estimate there are approximately 5,400 emergency standby engines and 170 prime engines owned and operated by local government agencies. As shown in Table IX-10, approximately 45 diesel backup engines and 167 diesel prime engines will incur capital costs associated with installation of a DECS. The remaining engines will incur minimal costs for reporting and record-keeping requirements proposed in the regulation.

Table IX-10: Estimated Number of Local Publicly Owned Stationary Diesel-Fueled CI Engines in California Potentially Requiring Installation of Diesel Emission Control Systems

Engine Application			Emission Control Systems			
	Category	Total Engine Population	Diesel Particulate Filter	Diesel Oxidation Catalyst	New Tier 4 Engine	None Needed
Emergency Standby	City	2,465		12		2,453
	County	923		8		915
	Other Local	2,044		25		2,019
	Total Local Standby	5,432		45		5,387
Prime	City	81	65	16	16	
	County	41	33	8	8	
	Other Local	45	36	9	9	
	Total Local Prime	167	134	33	33	

To estimate the expected costs of the proposed ATCM to local public agencies, we used the cost estimates and assumptions outlined in Tables IX-2 and IX-3 and the basic cost methodology discussed previously. Using these assumptions, the estimated average cost to retrofit or modify a emergency standby stationary diesel-fueled engine is about $5,600 for a city owned engine (average 450 hp) and $8,100 for a county owned engine (average 680 hp). The estimated total equipment and installation costs on local governments to modify prime and emergency standby stationary diesel-fueled engines will be approximately $6,354,000. The estimated discounted capital cost plus the annual additional operation and maintenance cost on local governments is approximately $1,021,000 annually. A brief summary of the estimated costs for local public agencies is presented in Table IX-11.

Table IX-11: Estimated Statewide Costs for Local Publicly Owned Stationary Diesel-Fueled CI Engines in California

Engine Application	Category	Total Capital Cost ($)	Annualized Capital Cost ($)	Annual Recurring Costs ($)	Total Annual Cost ($)
Emergency Standby	City	$370,000	$26,200	-$12,630	$13,600
	County	$191,900	$13,600	-$20,450	-$6,800
	Other	$396,600	$28,100	-$71,300	-$43,200
Prime	City	$2,624,200	$463,900	$52,600	$516,500
	County	$1,330,300	$235,200	$26,600	$261,800
	Other	$1,441,000	$254,700	$28,900	$283,600
Total		$6,354,000	$1,021,000	$3,700	$1,025,500

To estimate the fiscal impacts for fiscal year (FY) 2005-2006, we assumed that 25 percent of the total engines needing a retrofit would incur costs for that current year. As currently proposed, the regulation requires 1989 model year and pre-1989 model year engines to be in compliance by January 1, 2006; 1990 model year to 1995 model year engines to be in compliance by January 1, 2007; and 1996 and newer model year engines to be in compliance by January 1, 2008. In addition, owners of four or more engines have until January 1, 2009, to have all the engines in compliance with the performance standards specified in the regulation. Because we lacked detailed information on the age distribution of engines owned by local public agencies, we concluded a 25 percent compliance rate per year was reasonable. Using this assumption, we estimate the total cost for the 2005-2006 fiscal year is about 25 percent of the total annual cost, or $256,380.

There may also be other potential cost impacts. For example, for public agencies that contract with private companies, an increase in the contract cost may occur under the terms of the contract or at the renewal of the contract. Staff did not consider this a direct cost, and, therefore, did not include it in the cost to local government agencies.

The local air districts are responsible for enforcing this regulation. The enforcement of the engines affected by this regulation would probably take the form of a typical inspection. The typical inspection takes about one hour annually for a prime engine and about a half-hour every four years for an emergency engine. Based on the number of engines in the ARB Survey, the additional local costs on the air districts statewide will be approximately $362,000 per year for district enforcement.

Fiscal Effect on State Government

Several State agencies provide services requiring emergency backup diesel equipment for public safety. Examples of these operations include prisons, government data storage facilities, emergency flood control, and college campuses. Some agencies may also have prime engines such as wood chippers used for composting forest waste. Examples of the State agencies that potentially may be impacted by the ATCM include

the Department of Corrections, General Services, the University of California and the California State University systems, the Department of Water Resources, the Franchise Tax Board, and the Department of Fish and Game. Based on the ARB Survey, and as shown in Table IX-12, we estimate about 882 standby and 17 prime diesel engines operated by State agencies will be impacted by this regulation.

Table IX-12: Percentage of State Owned Stationary Diesel-Fueled CI Engines in California Potentially Requiring Installation of Diesel Emission Control Systems

Engine Application			Emission Control Systems			
Category		Total Engine Population	Diesel Particulate Filter	Diesel Oxidation Catalyst	New Tier 4 Engine	None Needed
Emergency Standby	State	882		9		873
Prime	State	17	14	3	3	

To estimate the expected costs associated with State agencies compliance with the regulation, we used the cost estimates and assumptions outlined in Tables IX-2 and IX-3 and the basic cost methodology discussed previously. As shown in Table IX-13, the proposed ATCM is expected to result in $754,500 initial capital cost to the State agencies. The fuel savings and retrofit costs of emergency standby engines are calculated over 25 years and the retrofit costs for prime engines are calculated over 10 years. The result is a low annual cost of $12,690.

A brief summary of the estimated costs for State agencies is presented in Table IX-13. Similar to the cost estimate for local public agencies, the expected costs for the FY 2005-2006 were estimated by assuming 25 percent of the engines would need to comply with the regulation in that year at a cost for equipment and installation of $189,000.

Table IX-13: Estimated Statewide Costs for State Owned Stationary Diesel-Fueled CI Engines in California

Engine Application	Total Capital Cost ($)	Annualized Capital Costs ($)	Annual Recurring Cost ($)	Total Annual Cost ($)
Emergency Standby	$198,900	$14,100	-$110,820	-$96,710
Prime	$555,900	$98,300	$11,140	$109,400
Total	$754,800	$112,400	-$99,680	$12,690

Fiscal Impact on Federal Agencies

Several federal agencies provide services requiring emergency backup diesel equipment for public safety. Examples of operations requiring emergency standby engines are prisons, government data storage facilities, and military bases. Examples of the federal agencies that potentially may be impacted by the ATCM include, the National Aeronautics and Space Administration (NASA), military bases, U.S. Park Service facilities, Federal Bureau of Prisons, and the Federal Aviation Administration. As shown in Table IX-14, we estimate approximately 3,594 emergency standby and 98 prime diesel engines operated by the federal government will be impacted by this regulation.

Table IX-14: Percentage of Federally Owned Stationary Diesel-Fueled CI Engines in California Potentially Requiring Installation of Diesel Emission Control Systems

Engine Application			Emission Control Systems				
Category		Total Engine Population	Diesel Particulate Filter	Diesel Oxidation Catalyst	New Engine + DPF	New Tier 4 Engine	None Needed
Emergency Standby	Federal	3,594		12			3,582
Prime	Federal	98	78	20		20	

Source: ARB Survey

To estimate the expected costs associated with federal agencies compliance with the regulation, we used the cost estimates and assumptions outlined in Tables IX-2 and IX-3 and the basic cost methodology discussed previously. As shown in Table IX-15, the estimated total capital costs of Federal agencies to comply with the regulation is $3,645,000, with annualized capital costs plus the annual operation and maintenance costs of about $632,000. The fuel savings and retrofit costs of emergency standby engines are calculated over 25 years, and the retrofit costs for prime engines are calculated over 10 years. Similar to the cost estimate for local public agencies, the expected costs for the FY 2005-2006 were estimated by assuming 25 percent of the engines would need to comply with the regulation in that year at a cost for equipment and installation of $911,250.

Table IX-15: Estimated Statewide Costs for Federally Owned Stationary Diesel-Fueled CI Engines in California

Engine Application	Total Capital Cost ($)	Annualized Capital Cost ($)	Annual Recurring Cost ($)	Total Annualized Cost ($)
Emergency Standby	$502,100	$35,600	-$22,100	$13,500
Prime	$3,142,900	555,600	$63,000	$618,500
Total	$3,645,000	$591,200	$40,900	$632,100

G. Summary of Total and Annual Costs for Compliance with the Proposed ATCM

In this section, the results shown in Tables IX-5 and IX-9 are summarized in Table IX-16 (i.e., the total cost of the ATCM to both private companies and governmental agencies). Based on these results, we estimate the total statewide capital costs for all affected entities in the State are $47 million, with an annualized cost of $8.4 million.

Table IX-16: Summary of Total Lifetime and Annualized Costs for Compliance with the Proposed ATCM

Engine Application	Category	Total Capital Cost	Annualized Capital Cost	Annual Recurring Costs ($)	Total Annualized Cost ($)
Emergency Standby	Private	$2,296,000	$163,000	-$123,000	$40,000
	State	$199,000	$14,000	-$111,000	-$97,000
	City	$370,000	$26,000	-$13,000	$14,000
	County	$192,000	$14,000	-$20,000	-$7,000
	Other Local	$397,000	$28,000	-$71,000	-$43,000
	Federal	$502,000	$36,000	-$22,000	$14,000
Prime	Private	$34,183,000	$5,979,000	$737,000	$6,716,000
	State	$556,000	$98,000	$11,000	$109,000
	City	$2,624,000	$464,000	$53,000	$516,000
	County	$1,330,000	$235,000	$27,000	$262,000
	Other Local	$1,441,000	$255,000	$29,000	$284,000
	Federal	$3,143,000	$556,000	$63,000	$619,000
Total		$47,233,000	$7,868,000	$560,000	$8,427,000

H. Cost Effectiveness

In this section, the cost-effectiveness of the ATCM is estimated. Cost effectiveness is expressed in terms of control costs (dollars) per unit of air emissions reduced (pounds). As described below, for example, the cost effectiveness for the proposed ATCM is determined by dividing the annualized capital costs plus the annual operation and maintenance costs by the annual pounds of diesel PM reduced. For the mortality cost-effectiveness, we presented the annualized capital costs and annual operation and maintenance costs in 2002 equivalent expenditure dollars.

The annualized capital costs and annual operation and maintenance have been represented differently for the cost effectiveness and mortality sections. ARB does not have data to determine multiple engine ownership and associated engine ages to accurately determine the retrofit phase in schedule. Therefore, the capital costs at the beginning of the ATCM implementation are phased in over four years to accommodate potential issues regarding the engine age and multiple engine ownership. Also, all costs are brought back to 2002 net present value to compare with other regulations. This method better represents when emission reductions will occur and more accurately represents costs further in the future.

Expected Emission Reductions

We estimated the projected annual emission reductions under the ATCM as described in Appendix D. The following provides a summary of the annual statewide reductions that will result from the proposed ATCM.

The baseline and ATCM-controlled diesel PM emissions are calculated based on the statewide inventory. These results are shown in Table IX-17.

Table IX-17: Estimated Statewide Diesel PM Annual Emissions and Reductions

Year	Uncontrolled Emissions (tons/day)	Controlled Emissions* (tons/day)	Reduction Emissions* (tons/day)	Reduction Emissions (tons/yr)
2005	0.8680	0.4067	0.4613	168.4
2006	0.8134	0.3957	0.4177	152.5
2007	0.7786	0.3816	0.3970	144.9
2008	0.7414	0.3619	0.3795	138.5
2009	0.7054	0.3450	0.3604	131.5
2010	0.6452	0.3482	0.2970	108.4
2011	0.6334	0.3112	0.3222	117.6
2012	0.5974	0.2943	0.3031	110.6
2013	0.5614	0.2774	0.2840	103.7
2014	0.5254	0.2605	0.2649	96.7
2015	0.4791	0.2137	0.2654	96.9
2016	0.4534	0.2267	0.2267	82.7
2017	0.4174	0.2098	0.2076	75.8
2018	0.3814	0.1929	0.1885	68.8
2019	0.3454	0.1760	0.1694	61.8
2020	0.3246	0.1720	0.1526	55.7

*Expected emissions and emission reductions due to implementation of ATCM

Cost Effectiveness

To determine the cost-effectiveness of the proposed regulation, we divided the annualized costs and annual ongoing costs by the diesel PM emission reductions attributable to the ATCM. The resulting cost effectiveness in each year of implementation up to 2020 is listed in Table IX-18. The estimated overall annual cost effectiveness, weighted by annual PM reduced, is $15.4 per pound of diesel PM reduced, if all the costs of compliance are allocated to diesel PM reduction. The range if from $4 to $26 per pound of diesel PM reduction. This cost effectiveness is near the lower end of anticipated cost effectiveness for diesel PM controls.

Table IX-18: Summary of Annual Cost Effectiveness for the Proposed ATCM

Year	Sum Annual Costs ($)	Inventory Based PM Reduced	Cost Effectiveness	
		(tons/yr)	($/ton)	($/lb)
2005	$ 1,354,316	145	$ 8,043	$ 4.02
2006	$ 3,108,844	125	$ 20,391	$ 10.20
2007	$ 4,693,204	114	$ 32,388	$ 16.19
2008	$ 6,119,622	103	$ 44,179	$ 22.09
2009	$ 5,842,752	93	$ 44,416	$ 22.21
2010	$ 5,578,374	73	$ 51,459	$ 25.73
2011	$ 5,409,320	76	$ 45,996	$ 23.00
2012	$ 5,159,407	68	$ 46,636	$ 23.32
2013	$ 4,135,495	61	$ 39,895	$ 19.95
2014	$ 3,197,399	54	$ 33,069	$ 16.53
2015	$ 2,358,752	51	$ 24,349	$ 12.17
2016	$ 1,592,726	42	$ 19,248	$ 9.62
2017	$ 1,336,349	36	$ 17,636	$ 8.82
2018	$ 1,100,777	32	$ 15,999	$ 8.00
2019	$ 900,639	27	$ 14,566	$ 7.28
2020	$ 717,067	23	$ 12,874	$ 6.44
Weighted Average =			$ 30,821	$ 15.41

Since the ATCM will also result in reductions in reactive organic gases (ROG) and oxides of nitrogen (NOx) emissions, staff conducted a second cost effectiveness analysis in which half of the cost of compliance was allocated to PM benefits and half the cost was allocated to ROG plus NOx benefits. This results in cost effectiveness values of $7.70/lb diesel PM, weighted by annual PM reduced, and $0.92/lb of ROG plus NOx, weighted by annual ROG plus NOx reduced. The resulting ROG plus NOx cost effectiveness for the combined standby and prime engines in the State are listed in Table IX-19. Based on their relative weights, the ROG and NOx cost effectiveness can be further expressed as $0.17 per pound ROG and $0.75 per pound NOx based on the respective weights. This cost effectiveness is near the lower end of anticipated cost effectiveness for diesel PM controls.

Table IX-19: Summary of Annual ROG Plus NOx Cost Effectiveness for the Proposed ATCM

Year	Sum of Annual[1] Costs ($)	Inventory Reduced			ROG+NOx Cost Effectiveness	
		ROG (tons/yr)	NOx (tons/yr)	ROG + NOx (tons/yr)	($/ton)	($/lb)
2005	$ 677,158	165	418	583	$ 1,162	$ 0.58
2006	$ 1,554,422	157	306	463	$ 3,358	$ 1.68
2007	$ 2,346,602	149	389	538	$ 4,360	$ 2.18
2008	$ 3,059,811	141	455	596	$ 5,131	$ 2.57
2009	$ 2,921,376	133	530	663	$ 4,407	$ 2.20
2010	$ 2,789,187	126	352	478	$ 5,839	$ 2.92
2011	$ 2,704,660	118	679	796	$ 3,396	$ 1.70
2012	$ 2,579,704	110	753	863	$ 2,989	$ 1.49
2013	$ 2,067,748	102	828	930	$ 2,224	$ 1.11
2014	$ 1,598,699	94	902	997	$ 1,604	$ 0.80
2015	$ 1,179,376	87	897	983	$ 1,199	$ 0.60
2016	$ 796,363	79	1,051	1,130	$ 705	$ 0.35
2017	$ 668,174	71	1,126	1,197	$ 558	$ 0.28
2018	$ 550,388	63	1,200	1,263	$ 436	$ 0.22
2019	$ 450,320	55	1,275	1,330	$ 339	$ 0.17
2020	$ 358,533	48	1,485	1,532	$ 234	$ 0.12
				Weighted Average =	$ 1,834	$ 0.92

[1] Annual costs is the sum of annualized capital costs and annual ongoing costs
Source: ARB Emissions Inventory, Off-Road Model

Cost-Effectiveness of the ATCM as Applied to Agricultural Operations

For several reasons, the ARB staff believes the ATCM is cost-effective for agricultural operations. First, the ATCM applies only to new diesel engines used in agricultural operations. Therefore, agricultural operations will not need to buy new compliant engines until they need such new engines. In that case, the agricultural operations would have replaced their existing engines with new engines irrespective of the ATCM. Second, the ATCM requires these new engines to meet a 0.15 g/bhp-hr diesel PM limit and the current off-road certification standards. As noted earlier in this chapter, such engines are readily available "off-the-shelf" and have been shown to be cost-effective. Third, the ATCM does not require retrofits on existing, in-use engines. Therefore, when agricultural operations decide to purchase new engines, they would be required to buy new engines that are already available "off-the-shelf" and cost-effective, which they would have done anyway irrespective of the ATCM. This is the basis for our finding that the cost attributable to the ATCM for agricultural operations is essentially zero for purchasing a new engine. And for these reasons, the ARB staff believes the ATCM is cost-effective for agricultural operations.

X. ADDITIONAL CONSIDERATIONS

In this chapter ARB staff provide additional supporting documentation for the proposed ATCM and discussion on issues raised during the development of the ATCM.

A. Direct-Drive Diesel Fire Pump Engines

The proposed ATCM establishes emission standards for emergency standby engines based on the hours of operation needed for maintenance and testing. The greater the number of hours operated for maintenance and testing, the more stringent the emission performance standard. During the development of the ATCM, concerns were raised regarding the application of the performance standard to emergency standby fire pump engines. Specifically, most fire pump engines are tested according to the National Fire Protection Association's (NFPA) "Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems" (NFPA 25), which requires approximately 26 hours of testing in a one year period with an additional two to four hours needed once every five years. Because these pump engines are used for fire protection, concerns were raised regarding the ability of the pump engines to perform with a diesel emission control strategy installed and whether the pump engines with emission controls would still be certified by the Underwriters Laboratory (UL) or FM Global (FM). The following explains fire pump engines, fire pump engine regulations and the requirements included in the ATCM that were proposed to address these concerns.

Fire Pump Engine Power Configurations

Fire pumps are used to supply water to building fire sprinkler systems. Fire pumps are needed at sites where water pressure is insufficient for fire protection. (Gray, 2001) There are thee main types of fire pump power configurations:

- Electric motor-driven fire pumps (electric pumps) are the most common method of powering fire pumps. Electric fire pumps are reliable power sources and offer no emissions.
- Electric motor-driven fire pumps with diesel generator backup engines are also commonly used. In this configuration, in the event of power interruption, the generator would provide electrical power to the fire pump.
- Direct-drive diesel engine fire pumps (direct-drive pumps) are fire pumps directly powered by a diesel-fueled engine. Generally, direct drive diesel engine fire pumps are used to power fire pumps in areas with unreliable electrical power and in remote areas. (Sweat, 2003)

Direct-drive pump engines are designed slightly different than other diesel-power sources; reliability and running until failure are priorities. According to a representative from Cummins Engine Company, Inc., there are two main differences in the engines. First, the cooling system is designed like that of a marine engine. The radiator is removed and water flow enters the engines from the water supply, exiting the engine flowing to the fire pump. This ensures that a constant supply of cool water flows into the

engine. Second, the electronic protection system is turned off. On non-direct-drive pumps, this system would normally protect the engine by preventing operation outside of normal specifications. By contrast, the system is turned off for direct-drive pumps so that the pumps operate to failure despite warnings for high water temperature, low oil pressure, or other condition outside of normal specifications. (Cummins, 2003a) (Cummins, 2003b)

Fire Pump Engine Maintenance and Testing Requirements

There are requirements in State law that specifies how fire pump engines should be maintained and tested. As discussed below, these requirements refer back to NFPA guidelines.

California regulations have requirements for the testing and maintenance of fire pump engines that are linked to NFPA guidelines. The current 2001 California Building Code, Chapter 35 "Uniform Building Code (UBC) Standard," page 1-308 refers to NFPA 13 "Standard for the Installation of Sprinkler Systems" which in turn refers to NFPA 25. Currently, the Office of the State Fire Marshal (SFM) office is adopting NFPA 25 in the update of title 19 of the California Code of Regulations as the standard for the inspection, testing, and maintenance of water-based fire protection systems. When NFPA 25 is incorporated into title 19, it will become an explicit standard in the California Building Code. (SFM, 2003)

There are two main NFPA standards concerning diesel fire pump engines and pumps. The first is NFPA 20 "Standard for the Installation of Stationary Pumps for Fire Protection." The second is NFPA 25 "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems." These two volumes cover what is needed to install, operate and maintain diesel fire pump engines/pumps. In addition, a separate standard, NFPA 110 "Standard for Emergency and Standby Power Systems," recommends guidelines for the maintenance and testing of emergency standby generators that are used for providing backup power to electrical systems, including electrically driven fire pumps. A summary of the suggested annual hours necessary for the recommended maintenance and testing requirements for these NFPA standards is provided in Table X-1. (NFPA, 1998) (NFPA, 2003)

Table X-1: Existing NFPA Maintenance and Testing Guidelines

	Fire Pump Power Configuration		
	Direct Drive	**Electric**	**Electric with Generator Backup**
Suggested Maintenance and Testing Hours Per Year	29-34 hours (30 minutes each week plus additional annual testing)	9 hours (10 minutes each week)	6 hours (30 minutes each month)
Reference Guidelines	NFPA 25 2001 UBC Chapter 35	NFPA 25	NFPA 110

Fire Pump Engine Inventory

Because concerns regarding fire pumps were raised late in the rulemaking process, the ARB Surveys did not collect information that would allow an estimate of the number of fire pump engines in California or the number of engines in each power configuration. However, based on the Sacramento Metropolitan Air Quality Management District (SMAQMD) permit data and conversations with fire pump distributors, ARB staff believes that the direct-drive diesel fire pumps are the least prevalent. The SMAQMD permit data showed 67 permitted fire pumps with 60 fire pumps being electric with generator backup and seven that we assumed were direct-drive fire pump engines. In addition, John Sweat (of The John Sweat Company), who installs and completes initial testing on fire pumps, and James Feld, a fire protection engineer, indicated that the majority of fire pumps are electric motors connected to the grid, followed by electric powered fire pumps with generator backup. The diesel direct-drives are generally used in remote areas or areas with unreliable power. (Sweat, 2003) (Feld, 2003)

ATCM Proposal for Fire Pump Engines

Based on the reasons discussed above, ARB staff incorporated a provision in the ATCM to allow in-use direct drive diesel fire pumps to continue to operate the annual hours necessary for compliance with NFPA 25 without meeting the performance standards for other emergency standby engines. ARB staff believes it is appropriate to allow these engines to exceed the 30-hour annual cap and not obtain district approval as required for other engines because of NFPA 25 requirements. NFPA 20 requires that diesel fire pump engines be specifically tested and listed for fire pump service by a testing laboratory. Installing an emission control system to modifying the exhaust system may void the UL or FM lab certification. Given the public safety concerns, ARB staff believes that the exemptions for the engines are appropriate.

B. In-Use Stationary Diesel-Fueled Engines Used in Agricultural Operations

The proposed Stationary Diesel Engine ATCM establishes performance standards (representing best available control technology) for new agricultural engines similar to the requirements for new emergency standby engines but without operating hour restrictions. New agricultural engines would be required to meet a 0.15 g/bhp-hr PM standard and the NMHC+NOx and CO standards in the U.S. EPA and ARB Non-Road Engine Emission Standards for the specific model year and horsepower category of the engine. New engines meeting the 0.15 g/bhp-hr PM requirement are currently available "off-the-shelf" for all engine horsepower categories greater than 50 hp, even though the certification standards for the engines in the 50 to 175 hp range are higher the 0.15 g/bhp-hr PM standard.

At this time, ARB staff is not proposing any performance standards or operating hour restrictions for in-use agricultural engines as part of the ATCM. For in-use agriculture engines, staff is working with the agricultural community and other parties to identify how best to reduce PM and NOx emission from stationary diesel engines used in

agricultural activities. As part of this effort, staff will be following the development of retrofit controls that could be reliably installed and maintained on engines in agricultural uses. If we determine that technically feasible and cost-effective retrofit controls become available for in-use agricultural engines we will propose amendments to the ATCM. Below is a discussion of the rationale for the ARB staff's proposal.

Staff's proposal requires new agricultural engines to be the cleanest currently produced by engine manufacturers. The proposal does not require the installation of retrofit controls for new or in-use agricultural engines, as required for non-agricultural prime engines. At this time, ARB staff believes that it is infeasible to require retrofit controls on new or in-use agricultural engines because of retrofit installation and availability issues unique to engines in agricultural service and the lack of implementation and enforcement mechanisms because these engines are not subject to district permit.

A major factor in staff's decision not to require retrofit controls for new or in-use agricultural engines is retrofit installation and availability issues. Engine manufacturers currently are not producing engines with add-on PM controls for off-road applications and retrofit manufacturers have not offered retrofit controls that can be readily installed on in-use engines in-field locations. The purchaser of a new agricultural engine would have to arrange to have retrofit controls installed after purchase. It would be very difficult for the individual farmer or the local engine dealer to arrange for installation of retrofit controls since it is currently not an option offered by the engine manufacturer or adapted by the retrofit manufacturer. Staff believes that to successfully implement retrofits requirements for engines in agricultural service, bolt-on retrofit kits will be needed. When this occurs, staff is committed to coming back to the Board to amend the ATCM.

In addition to the retrofit installation and availability issue, there are implementation and enforcement issues affecting control of new and in-use agricultural engines. H&SC section 42310 exempts any equipment used in agricultural operations from having to obtain a permit.[17] The ATCM relies on an effective permit system to ensure that controls are properly designed, installed, and operated. Staff believes that it would be extremely difficult and resource intensive to implement retrofit control requirements without a permitting system. Requiring a permit provides a mechanism for obtaining critical data on engine location, make/model, model year, horsepower, and operating hours. More importantly, it provides an enforceable mechanism for the district to obtain the information necessary to determine if the selected equipment is capable of meeting the requirements of the ATCM. Because of the permitting restriction, staff believes that the best approach is to require new agricultural engines to meet the lowest achievable off-road engine standards and to not require retrofits on in-use agricultural engines.

Finally, staff also believes that any effort that would require retrofit controls for new and existing engines needs to be closely coordinated with on-going programs to reduce emissions of both PM and NOx from these engines. This effort is continuing and should

[17] SB 700 was signed into law by Governor Davis on September 22, 2003, and eliminates the exemption from permits in State law for any equipment used in agricultural operations.

be fully integrated with any ATCM requirements for existing engines. Currently a large number of older agricultural engines have been replaced with newer engines meeting the 0.15 g/bhp-hr PM standard and with lower NOx emissions under the Carl Moyer program. Due to increased costs, we believe that requiring retrofit controls on in-use engines may make it less likely that these engines will be removed from service and replaced with electric power. We believe that replacing diesel engines with electric power may be the best long-term approach for reducing PM and NOx emissions from stationary agricultural engines. Because of the factors discussed above, more time and effort is needed to determine how best to further reduce PM emissions from engines in agricultural operations. We plan to report back to the Board by June 2004 with an analysis of the feasibility of converting agricultural diesel engines to electrical power.

C. Cumulative Risk

The proposed ATCM addresses the emissions from single sources and does not take into consideration the cumulative impacts of multiple sources in close proximity. Concerns have been raised that individual sources may not exceed acceptable regulatory standards, but pose a significant health hazard when the emissions from multiple sources overlap or when there is a high concentration of polluting sources. The ARB is currently developing sophisticated tools to provide information to use in cumulative impact analyses and for use by other agencies such as local air districts and land use planners in addressing cumulative air impacts. These tools include regional risk maps, enhanced air dispersion models, and improved emissions inventories. These tools are data intensive and are still under development.

While the proposed ATCM does not initially address cumulative impacts, it establishes a process to receive information from owners of stationary diesel engines that can be used in future analyses when the tools are fully developed. The reporting requirements of the proposed ATCM will provide information, such as the location of engines, size, emissions, fuel and control equipment. This information may be used in a variety of programs to determine the potential for significant health risks in a cumulative impact analysis. Some of the programs where this type of information may be used to address potential cumulative impacts include local air district permitting, "Hot Spots" Program, or possible development of more stringent regulatory standards at either the State or local level.

D. Interruptible Service Contracts

Since the mid-1980s, investor-owned utilities are authorized to offer optional "interruptible or curtailable" electric service to customers at discounted rates in exchange for the customer reducing power consumption from the grid during periods when available grid power is insufficient to meet all demand while maintaining an adequate reserve margin. If demand exceeds supply after voluntary interruptions, utilities implement rotating outages based on the Public Utilities Commission authorized curtailment priorities. In exchange for agreeing to have service interrupted, customers receive discounts on their electricity service under interruptible service contracts (ISCs).

In some cases, customers with ISCs operate emergency standby engines as a way to reduce their consumption of power from the grid and, in effect, become self-generators of electricity. These interruptible programs serve as a type of insurance policy against uncertainty and function to provide statewide grid reliability and reduce the probability of experiencing rotating outages or catastrophic system collapse. (PUC, 2002)

Participation in interruptible service programs has decreased over the past several years. In previous years, various programs provided up to 2,800 MW of interruptible load capacity. The same programs provided only 1,600 MW capacity in 2001, and 1,400 MW capacity in 2002. The duration of all interruptible programs were extended through the date of the final decision in the rate design phase of each utility's next general rate case application, i.e., either by the end of 2003 or early 2004. Assembly Bill 425, proposed in the 2003-2004 California State legislative session, proposes to extend the availability of these types of programs or curtailable service to qualified customers until January 1, 2009.

ARB staff could not determine with any certainty the number of facilities operating diesel-fueled engines under ISCs that are associated with the three major investor-owned utilities in California. The Pacific Gas and Electric Company estimates about one third of the 335 MW currently in ISC contracts would be produced by stationary diesel-fueled engines. Southern California Edison could not give an estimate of the number of emergency standby engines in their interruptible load programs. San Diego Gas and Electric has a special type of interruptible program and estimated that they have approximately 60 diesel-fueled stationary engines in their Rolling Blackout Reduction Program.[18] Based on the ARB Survey, approximately 230 of the 3,200 engines for which data was reported in the survey, reported hours of operation in response to an ISC agreement. Of these engines, the average number of hours the engines were used during a low grid power period were about 26 hours per engine per year.

During the development of the ATCM, staff considered how the ATCM should address the continued use of emergency standby engines in interruptible programs. Some entities with existing contracts claimed that operating diesel-fueled emergency standby engines was justified because ISC contracts help prevent blackouts, which could result in the widespread use of diesel-fueled emergency standby engines during rolling blackouts. Others argued against their use, raising concerns about public exposures to diesel PM and continued reliance on a power source that is orders of magnitude dirtier than a gas-fired plant in terms of pollution produced per megawatt of electricity generator.

While possible approaches were explored during the ATCM development, it was not possible to reach agreement on how this issue should be treated prior to the beginning

[18] A special type of ISC is the Rolling Blackout Reduction Program in San Diego County. Under this program, certain engines that have signed up to participate are asked to voluntarily reduce power when grid power reached critically low levels. In exchange for reducing power from the grid, the company is paid 20 cents a kilowatt for the power demand reduced.

of the 45-day public comment period. ARB staff will continue to meet and confer on this issue and may provide a proposal to the Board at the November 13-14, 2003, hearing that would allow the continued use of some of these engine under the proposed ATCM.

E. Harmonization of the Proposed ATCM and the AB 2588 "Hot Spots" Requirements

The Air Toxics "Hot Spots" Information and Assessment Act (Assembly Bill (AB) 2588) was enacted in September 1987 (Health and Safety Code 44300-44394). The goals of the Air Toxics "Hot Spots" Act are to collect emissions data, to identify facilities having localized impacts, to ascertain health risks, and to notify nearby residents of significant risks. In September 1992, the "Hot Spots" Act was amended by Senate Bill (SB) 1731 to address the reduction of significant risks. The bill requires owners of significant-risk facilities to reduce their risks below the level of significance.

Guidance documents are currently available for conducting emission inventories, facility prioritizations, risk assessments, and public notifications. ARB developed the Emission Inventory Criteria And Guidelines for conducting emission inventories, while CAPCOA developed the Facility Prioritization Guidelines, Risk Assessment Guidelines, and the Public Notification Guidelines. Under these guidelines, diesel fueled engines or facilities with diesel-fueled engines must meet AB 2588 requirements if they use 3,000 or more gallons per year of diesel fuel. Many diesel engine operators, particularly those with emergency standby engines have not been subject to the "Hot Spots" requirements because of this usage requirement. In August 1998, the ARB approved the listing of diesel PM as a TAC and the SRP conclusion that a value of 3×10^{-4} $(ug/m^3)^{-1}$ is a reasonable estimate of unit risk from diesel-fueled engines. Now that a unit risk factor has been approved, districts are required to reevaluate the classification of facilities subject to the "Hot Spots" program, specified in H&SC section 44320, that are operating stationary diesel-fueled engines.

To assist the districts in this effort, ARB staff is currently developing amendments to the AB 2588 Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines Regulation to address diesel engines. These amendments are being developed to align with the ATCM requirements, avoid duplicative requirements, and ensure that potential risks from all engines are evaluated and mitigated where necessary.

The ARB staff believes that the initial reporting requirement in the ATCM will also fulfill the emission inventory requirement of the "Hot Spots" program. In some cases, compliance with the ATCM will fulfill all requirements under the "Hot Spots" program. For example, for owners of a single emergency standby diesel engine at a facility currently not in the "Hot Spots" program, compliance with the ATCM will also reduce the potential risk from that engine to below 10 in a million. For these engines, compliance with the ATCM will also fulfill the "Hot Spots" requirements, provided the district has a 10 in a million significance level.

For owners of prime engines, multiple prime or emergency standby engines, or engines that are in "Hot Spots" facilities, additional site specific evaluations will likely be needed to determine if the resulting risk is too high and needs to be reduced. It will be important for these facilities to consider the "Hot Spots" requirements concurrent with their obligation under the ATCM, because additional controls above and beyond what are required in the ATCM may be necessary in some cases.

The proposed amendments to the "Hot Spots" Emission Inventory Criteria and Guidelines Regulation are tentatively scheduled to be considered by the Board at the December 2003 hearing. ARB staff expects to conduct additional workshops this fall to further define the necessary modifications to the regulation.

F. Potential Federal Requirements That May Apply to Stationary Diesel-Fueled Engines

On December 19, 2002, U.S. EPA proposed *The National Emission Standard for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines* (RICE NESHAP or NESHAP) in the Federal Register (40 CFR Part 63). (EPA, 2002) As currently proposed, the RICE NESHAP would establish requirements for stationary internal combustion engines rated above 500 horsepower (hp) that are located at major sources of hazardous air pollutants (HAPs). The comment period for this NESHAP ended on February 18, 2003. The U.S. EPA is in the process of reviewing the comments received. Based on their current schedule, the NESHAP will be promulgated in February 2004. The rule would be effective immediately giving new sources 180 days to comply, and existing sources up to three years to comply.

As proposed, the RICE NESHAP would affect facilities in California that are also subject to the proposed ATCM. The NESHAP requires installation of a diesel oxidation catalyst (DOC) to reduce HAPs (aldehydes) and carbon monoxide. It also includes recordkeeping, monitoring, and testing requirements. Because the NESHAP does not recognize particulate matter (PM) as a public health concern, it is not designed to reduce PM emissions, and it does not allow for the installation of a DPF in lieu of a DOC. As a result, facilities complying with the ATCM may be required to install additional controls and to conduct continuous monitoring with little or no additional environmental benefit. ARB staff raised several concerns regarding the RICE NESHAP proposal including: (1) that the State and Local agencies have authority to regulate PM to reduce diesel exhaust risk, which is also a goal in the Urban Air Toxic Strategy; (2) that the EPA should recognize that DPFs are more effective in reducing diesel engine emissions; and (3) the current definition of "reconstruction" may affect facilities in California using retrofit technologies and may exceed the reconstruction cost threshold. A copy of ARB's comment letter to the U.S. EPA is included in Appendix J.

The U.S. EPA is also in the process of writing a New Source Performance Standard (NSPS) for diesel engines. The NSPS will include controlling emissions, including PM, from existing engines and small diesel engines (as low as 50 hp). With work beginning

on the NSPS, the EPA may consider a delay in implementing the diesel engine part of the NESHAP until the NSPS is complete.

The ARB staff will continue to work with the EPA to coordinate both the NESHAP and NSPS requirements with the ARB stationary ATCM.

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Appendix A

Proposed Airborne Toxic Control Measure for Stationary Compression Ignition Engines

PROPOSED REGULATION ORDER

AIRBORNE TOXIC CONTROL MEASURE FOR STATIONARY COMPRESSION IGNITION ENGINES

Adopt new section 93115, title 17, California Code of Regulations, to read as follows:

17 CCR, section 93115. Airborne Toxic Control Measure for Stationary Compression Ignition (CI) Engines.

(a) Purpose

The purpose of this airborne toxic control measure (ATCM) is to reduce diesel particulate matter (PM) and criteria pollutant emissions from stationary diesel-fueled compression ignition (CI) engines.

NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013, Health and Safety Code. Reference: Sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

(b) Applicability

(1) Except as provided in subsection (c), this section applies to any person who either sells a stationary CI engine, offers a stationary CI engine for sale, leases a stationary CI engine, or purchases a stationary CI engine for use in California.

(2) Except as provided in subsection (c), this section applies to any person who owns or operates a stationary CI engine in California with a rated brake horsepower greater than 50 (>50 bhp).

(3) No later than 120 days after the approval of this section by the Office of Administrative Law, each air pollution control and air quality management district (district) shall:

(A) implement and enforce the requirements of this section; or
(B) propose and adopt its own ATCM to reduce diesel PM from stationary diesel-fueled CI engines as provided in Health and Safety Code section 39666(d).

NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013, Health and Safety Code. Reference: Sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

(c) Exemptions

(1) The requirements of this section do not apply to portable CI engines or CI engines used to provide the motive power for on-road and off-road vehicles.

(2) The requirements of this section do not apply to CI engines used for the propulsion of marine vessels or auxiliary CI engines used on marine vessels.

(3) The requirements of this section do not apply to in-use stationary CI engines used in agricultural operations.

(4) The requirements specified in subsections (e)(2)(A) and (e)(2)(C) do not apply to new stationary CI engines used in agricultural operations.

(5) The requirements specified in subsection (e)(3) do not apply to single cylinder cetane test engines used exclusively to determine the cetane number of diesel fuels in accordance with American Society for Testing and Materials (ASTM) Standard D 613-03b.

(6) The requirements specified in subsections (e)(2)(B)3. and (e)(2)(D)1. do not apply to in-use stationary diesel-fueled CI engines used in emergency standby or prime applications that, prior to January 1, 2005, were required in writing by the district to meet either minimum technology requirements or performance standards implemented by the district from the *Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines,* October 2000, which is incorporated herein by reference.

(7) The requirements specified in subsection (e)(2)(B)3. do not apply to permitted in-use stationary emergency standby diesel-fueled CI engines that will be removed from service or replaced prior to January 1, 2009, in accordance with an approved Office of Statewide Health Planning Development (OSHPD) Compliance Plan that has been approved prior to January 1, 2009, except that this exemption does not apply to replacement engines for the engines that are removed from service under the OSHPD plan.

(8) The requirements in subsections (e)(1), (e)(2)(C), and (e)(2)(D) do not apply to any stationary diesel-fueled CI engine used solely for:

(A) the training of United States Air Force (USAF) maintenance officers or enlisted personnel, or civilian government employees of the USAF, and is identified as Class I Training Equipment in accordance with Air Force Space Command Instruction 21-0114, dated March 27, 2000, which is incorporated herein by reference; or

(B) the training of United States (U.S.) Navy personnel, and is identified as a shore based trainer that must be made fully compatible with fleet systems both in configuration and design capability in order to fully support fleet

training requirements and sustain operational readiness, in accordance with Office of the Chief of Naval Operations (OPNAV) Instruction 1500.51B, dated March 31, 1989, which is incorporated herein by reference; or

(C) the training of U.S. Department of Defense (U.S. DoD) students or personnel of any U.S. military branch in the operation, maintenance, repair, and rebuilding of engines, similar to those owned or operated by the U.S. DoD or U.S. military services that are used in combat, combat support, combat service support, tactical or relief operations, or training for such activities.

(9) The requirements specified in subsections (e)(1) and (e)(2) do not apply to stationary diesel-fueled CI engines used solely on San Nicolas or San Clemente Islands. The Ventura County Air Pollution Control District APCO and the South Coast Air Quality Management District APCO shall review the land use plans for the island in their jurisdiction at least once every five (5) years and withdraw this exemption if the land use plans are changed to allow use by the general public of the islands.

(10) The requirements specified in subsection (e)(2) do not apply to stationary diesel-fueled engines used solely on outer continental shelf (OCS) platforms located within 25 miles of California's seaward boundary.

(11) **Request for Exemption for Emergency Engines at Nuclear Facilities.** Consistent with section 39666(d) of the Health and Safety Code, the district APCO may approve a Request for Exemption from the provisions of subsection (e)(2)(B)3. for any in-use stationary diesel-fueled CI engines, provided the approval is in writing, the writing specifies all of the following conditions to be met by the owner or operator, and the writing contains the following information to be provided by the district:

(A) the engine is an emergency standby engine;
(B) the engine is subject to the requirements of the U.S. Nuclear Regulatory Commission;
(C) the engine is used solely for the safe shutdown and maintenance of a nuclear facility when normal power service fails or is lost;
(D) the engine undergoes maintenance and testing operations for no more than 200 hours cumulatively per calendar year; and
(E) the district specifies in the approval any additional criteria that must be met.

(12) **Request for Exemption for Low-Use Prime Engines Outside of School Boundaries.** Consistent with section 39666(d) of the Health and Safety Code, the district APCO may approve a Request for Exemption from the provisions of subsection (e)(2)(D)1. for any in-use stationary diesel-fueled CI engine located beyond school boundaries, provided the approval is in writing, the writing specifies all of the following conditions to be met by the owner or operator, and the writing contains the following information to be provided by the district:

(A) the engine is a prime engine;
(B) the engine is located more than 1000 feet from a school at all times; and
(C) the engine operates no more than 20 hours cumulatively per year.

(13) The requirements in subsections (e)(2)(B)3. and (e)(2)(D)1. do not apply to in-use dual-fueled diesel pilot CI engines that use an alternative fuel or an alternative diesel fuel.

(14) The requirements in subsection (e)(1), (e)(2)(A)3., (e)(2)(B)3., (e)(2)(C)1., and (e)(2)(D)1. do not apply to dual-fueled diesel pilot CI engines that use diesel fuel and digester gas or landfill gas.

(15) The requirements in subsections (e)(2)(B)3. and (e)(2)(D)1. do not apply to in-use stationary diesel-fueled CI engines that have selective catalytic reduction systems.

(16) The requirements of subsection (e)(2)(B)3. do not apply to in-use emergency fire pump assemblies that are driven directly by stationary diesel- fueled CI engines and only operated the number of hours necessary to comply with the testing requirements of National Fire Protection Association (NFPA) 25 - *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* 1998 edition, as referenced through NFPA 13 - *Standard for the Installation of Sprinkler Systems,* 1999 edition, in the 2001 California Building Code, 24 CCR part 2, vol. 2, chapter 35, Uniform Building Code Standards, all three of which are incorporated herein by reference.

(17) The requirements of subsection (e)(1), (e)(2)(A)3., (e)(2)(B)3., (e)(2)(C), and (e)(2)(D) do not apply to any stationary diesel-fueled CI engine used to power equipment that is owned by the National Aeronautics and Space Administration (NASA) and used solely at a space shuttle landing site, provided the District APCO approves this exemption in writing consistent with section 39666(d) of the Health and Safety Code. This exemption only applies to diesel engines that power equipment which is maintained in the same configuration as similar equipment at all space shuttle facilities.

NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013, Health and Safety Code. Reference: Sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

(d) Definitions

For purposes of this section, the following definitions apply:

(1) "Agricultural Operations" means the growing and harvesting of crops or the raising of fowl or animals for the primary purpose of making a profit, providing a

livelihood, or conducting agricultural research or instruction by an educational institution. Agricultural operations do not include activities involving the processing or distribution of crops or fowl.

(2) "Air Pollution Control Officer" means the Executive Officer or director of a district, or his or her designated representative.

(3) "Alternative Fuel" means natural gas, propane, ethanol, or methanol.

(4) "Alternative Diesel Fuel" means any fuel used in a CI engine that is not a reformulated CARB diesel fuel as defined in Title 13 CCR Sections 2281 and 2282 or an alternative fuel, and does not require engine or fuel system modifications for the engine to operate, although minor modifications (e.g., recalibration of the engine fuel control) may enhance performance. Examples of alternative diesel fuels include, but are not limited to, biodiesel; Fischer-Tropsch fuels; emulsions of water in diesel fuel; and fuels with a fuel additive, unless:

(A) the additive is supplied to the engine fuel by an on-board dosing mechanism, or
(B) the additive is directly mixed into the base fuel inside the fuel tank of the engine, or
(C) the additive and base fuel are not mixed until engine fueling commences, and no more additive plus base fuel combination is mixed than required for a single fueling of a single engine.

(5) "Approach Light System with Sequenced Flasher Lights in Category 1 and Category 2 Configurations (ALSF-1 and ALSF-2)" means high intensity approach lighting systems with sequenced flashers used at airports to illuminate specified runways during category II or III weather conditions, where category II means a decision height of 100 feet and runway visual range of 1,200 feet, and category III means no decision height or decision height below 100 feet and runway visual range of 700 feet.

(6) "Baseline or Baseline Emissions" means the emissions level of a diesel-fueled engine using CARB diesel fuel as configured upon initial installation or by January 1, 2003, whichever is later.

(7) "California Air Resources Board (CARB) Diesel Fuel" means any diesel fuel that meets the specifications defined in subsection (d)(12) and meets the specifications defined in title 13 CCR, sections 2281-2282.

(8) "Carbon Monoxide (CO)" is a colorless, odorless gas resulting from the incomplete combustion of hydrocarbon fuels.

(9) "Compression Ignition (CI) Engine" means an internal combustion engine with operating characteristics significantly similar to the theoretical diesel combustion cycle. The regulation of power by controlling fuel supply in lieu of a throttle is indicative of a compression ignition engine.

(10) "Control Area" means any electrical region in California that regulates its power generation in order to balance electrical loads and maintain planned interchange schedules with other control areas.

(11) "Cumulatively" means the aggregation of hours or days of engine use, and any portion of an hour or day of engine use, toward a specified time limit(s).

(12) "Diesel Fuel" means any fuel that meets the American Society for Testing and Materials (ASTM) D975-03, *Standard Specification for Diesel Fuel Oils*, which is incorporated herein by reference. "Diesel Fuel" includes, but is not limited to, No. 1-D, No. 1-D low sulfur, No. 2-D, No. 2-D low sulfur, and No. 4-D diesel fuel oils.

(13) "Diesel-Fueled" means fueled by diesel fuel, CARB diesel fuel, or jet fuel, in whole or part.

(14) "Diesel Particulate Filter (DPF)" means an emission control technology that reduces PM emissions by trapping the particles in a flow filter substrate and periodically removes the collected particles by either physical action or by oxidizing (burning off) the particles in a process called regeneration.

(15) "Diesel Particulate Matter (PM)" means the particles found in the exhaust of diesel-fueled CI engines as determined in accordance with the test methods identified in subsection (i).

(16) "Digester Gas" is any gas derived from anaerobic decomposition of organic matter.

(17) "District" means an air pollution control district or air quality management district created or continued in existence pursuant to provisions of Part 3 (commencing with section 40000) of the California Health and Safety Code. Each district is headed by an Air Pollution Control Officer (APCO).

(18) "Dual-fuel Diesel Pilot Engine" means a dual-fueled engine that uses diesel fuel as a pilot ignition source at an annual average ratio of less than 5 parts diesel fuel to 100 parts total fuel on an energy equivalent basis.

(19) "Dual-fuel Engine" means any CI engine that is engineered and designed to operate on a combination of alternative fuels, such as compressed natural gas (CNG) or liquefied petroleum gas (LPG) and diesel fuel or an alternative diesel

fuel. These engines have two separate fuel systems, which inject both fuels simultaneously into the engine combustion chamber.

(20) "Emergency Standby Engine" means a stationary engine operated solely during an emergency use, except as otherwise permitted for maintenance and testing operations, emission testing, to provide power in response to the notification of an impending rotating outage, and initial start-up testing, as specified in (e)(2)(A) and (e)(2)(B).

(21) "Emergency Use" means providing electrical power or mechanical work during any of the following events and subject to the following conditions:

(A) the failure or loss of all or part of normal electrical power service or normal natural gas supply to the facility:
1. which is caused by any reason other than the enforcement of a contractual obligation the owner or operator has with a third party or any other party; and
2. which is demonstrated by the owner or operator to the district APCO's satisfaction to have been beyond the reasonable control of the owner or operator;

(B) the failure of a facility's internal power distribution system:
1. which is caused by any reason other than the enforcement of a contractual obligation the owner or operator has with a third party or any other party; and
2. which is demonstrated by the owner or operator to the district APCO's satisfaction to have been beyond the reasonable control of the owner or operator;

(C) the pumping of water or sewage to prevent or mitigate a flood or sewage overflow;

(D) the pumping of water for fire suppression or protection;

(E) the powering of ALSF-1 and ALSF-2 airport runway lights under category II or III weather conditions.

(22) "Emission Control Strategy" means any device, system, or strategy employed with a diesel-fueled CI engine that is intended to reduce emissions including, but not limited to, particulate filters, diesel oxidation catalysts, selective catalytic reduction systems, fuel additives used in combination with particulate filters, alternative diesel fuels, and any combination of the above.

(23) "End User" means any person who purchases or leases a stationary diesel-fueled engine for operation in California. Persons purchasing engines for resale are not considered "end users."

(24) "Executive Officer" means the executive officer of the Air Resources Board, or his or her designated representative.

(25) "Facility" means one or more contiguous properties, in actual physical contact or separated solely by a public roadway or other public right-of-way, under common ownership on which engines operate.

(26) "Fuel Additive" means any substance designed to be added to fuel or fuel systems or other engine-related engine systems such that it is present in-cylinder during combustion and has any of the following effects: decreased emissions, improved fuel economy, increased performance of the engine; or assists diesel emission control strategies in decreasing emissions, or improving fuel economy or increasing performance of the engine.

(27) "Generator Set" means a CI engine coupled to a generator that is used as a source of electricity.

(28) "Hydrocarbon (HC)" means the sum of all hydrocarbon air pollutants.

(29) "In-Use" means a CI engine that is not a "new" CI engine.

(30) "Initial Start-up Testing" means operating the engine or supported equipment to ensure their proper performance either:

(A) for the first time after initial installation of a new stationary diesel-fueled CI engine at a facility, or
(B) for the first time after installation of emission control equipment on an in-use stationary diesel-fueled CI engine.

(31) "Jet Fuel" means fuel meeting any of the following specifications:

(A) ASTM D 1655-02, *Standard Specification for Aviation Turbine Fuels*, which is incorporated herein by reference. Jet fuels meeting this specification includes Jet A, Jet A-1, and Jet B;
(B) Military Detail (MIL-DTL) 5624T, *Turbine Fuels, Aviation, Grades Jet Propellant (JP) JP-4, JP-5, and JP-5/JP8 ST*, dated September 18, 1998, which is incorporated herein by reference; and
(C) Military Test (MIL-T) 83133E, *Turbine Fuels, Aviation, Kerosene Types, North Atlantic Treaty Organization (NATO) F-34 (JP-8), NATO F-35* and *JP-8+100*, dated April 1, 1999, which is incorporated herein by reference.

(32) "Landfill Gas" means any gas derived through any biological process from the decomposition of waste buried within a waste disposal site.

(33) "Location" means any single site at a facility.

(34) "Maintenance and Testing" means operating an emergency standby CI engine to evaluate the ability of the engine or its supported equipment to perform

during an emergency. Supported equipment includes, but is not limited to, generators, pumps, transformers, switchgear, and breakers.

(35) "Model Year" means the stationary CI engine manufacturer's annual production period, which includes January 1st of a calendar year, or if the manufacturer has no annual production period, the calendar year.

(36) "New" or "New CI Engine" means the following:

(A) a stationary CI engine installed at a facility after January 1, 2005, including an engine relocated from an off-site location after January 1, 2005, except the following shall be deemed in-use engines:

1. a replacement stationary CI engine that is installed to temporarily replace an in-use engine while the in-use engine is undergoing maintenance and testing, provided the replacement engine emits no more than the in-use engine and the replacement engine is not used more than 180 days cumulatively in any 12-month rolling period;
2. an engine that was approved by the District for installation prior to the effective date of this section but is not installed until after January 1, 2005;
3. an engine that is one of four or more engines owned by an owner or operator and is relocated prior to January 1, 2008 to an offsite location that is owned by the same owner or operator;
4. an engine installed prior to or on January 1, 2005 in a facility used in agricultural operations that is owned by an owner or operator, which is subsequently relocated to an offsite location that is owned by the same owner or operator.

(B) a stationary CI engine that has been reconstructed after January 1, 2005 shall be deemed a new engine unless:

1. the sum of the costs of all individual reconstructions of that engine after January 1, 2005 is less than 50% of the lowest-available purchase price, determined at the time of the most recent reconstruction, of a complete, comparably-equipped new engine (within ±10% of the reconstructed engine's brake horsepower rating).

For purposes of this definition, the cost of reconstruction and the cost of a comparable new engine shall not include the cost of equipment and devices required to meet the requirements of this ATCM.

(37) "Nitrogen Oxides (NOx)" means compounds of nitric oxide (NO), nitrogen dioxide (NO_2), and other oxides of nitrogen, which are typically created during combustion processes and are major contributors to smog formation and acid deposition.

(38) "Non-Methane Hydrocarbons (NMHC)" means the sum of all hydrocarbon air pollutants except methane.

(39) "Owner or Operator" means any person subject to the requirements of this section, including but not limited to:

(A) an individual, trust, firm, joint stock company, business concern, partnership, limited liability company, association, or corporation including but not limited to, a government corporation; and
(B) any city, county, district, commission, the state or any department, agency, or political subdivision thereof, any interstate body, and the federal government or any department or agency thereof to the extent permitted by law.

(40) "Particulate Matter (PM)" means the particles found in the exhaust of CI engines, which may agglomerate and adsorb other species to form structures of complex physical and chemical properties.

(41) "Portable CI Engine" means a compression ignition (CI) engine designed and capable of being carried or moved from one location to another, except as provided in subsection (d)(50). Indicators of portability include, but are not limited to, wheels, skids, carrying handles, dolly, trailer, or platform. The provisions of this definition notwithstanding, an engine with indicators of portability that remains at the same facility location for more than 12 consecutive rolling months or 365 rolling days, whichever occurs first, not including time spent in a storage facility, shall be deemed a stationary engine.

(42) "Prime CI Engine" means a stationary CI engine that is not an emergency standby CI engine.

(43) "Rated Brake Horsepower" means the maximum horsepower rating for an engine, as specified by the manufacturer or manufacturer-authorized engine dealer or distributor and listed on the nameplate of the unit.

(44) "Receptor location" means any location outside the boundaries of a facility where a person may experience exposure to diesel exhaust due to the operation of a stationary diesel-fueled CI engine. Receptor locations include, but are not limited to, residences, businesses, hospitals, daycare centers, and schools.

(45) "Reconstruction" means the rebuilding of the engine or the replacement of engine parts, including pollution control devices, but excluding operating fluids; lubricants; and consumables such as air filters, fuel filters, and glow plugs that are subject to regular replacement.

(46) "Rotating Outage" means a controlled, involuntary curtailment of electrical power service to consumers as ordered by the Utility Distribution Company.

(47) "School" means any public or private school used for purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in private homes.

(48) "Selective Catalytic Reduction (SCR) System" means an emission control system that reduces NOx emissions through the catalytic reduction of NOx in diesel exhaust by injecting nitrogen-containing compounds into the exhaust stream, such as ammonia or urea.

(49) "Seller" means any person who sells, leases, or offers for sale any stationary diesel-fueled engine directly to end users.

(50) "Stationary CI Engine" means a CI engine that is designed to stay in one location, or remains in one location. A CI engine is stationary if any of the following are true:

(A) the engine or its replacement is attached to a foundation, or if not so attached, will reside at the same location for more than 12 consecutive months. Any engine such as backup or standby engines, that replaces an engine at a location and is intended to perform the same or similar function as the engine(s) being replaced, shall be included in calculating the consecutive time period. The cumulative time of all engine(s), including the time between the removal of the original engine(s) and installation of the replacement engine(s), will be counted toward the consecutive time period; or

(B) the engine remains or will reside at a location for less than 12 consecutive months if the engine is located at a seasonal source and operates during the full annual operating period of the seasonal source, where a seasonal source is a stationary source that remains in a single location on a permanent basis (at least two years) and that operates at that single location at least three months each year; or

(C) the engine is moved from one location to another in an attempt to circumvent the 12 month residence time requirement. The period during which the engine is maintained at a storage facility shall be excluded from the residency time determination.

(51) "Stationary Source" means an emission unit or aggregation of emission units which are located on the same or contiguous properties and which units are under common ownership or entitlement to use. Stationary sources also include those emission units or aggregation of emission units located in the California Coastal Waters. "Emission Unit" means any article, machine,

equipment, contrivance, process, or process line that emit(s) or reduce(s), or may emit or reduce, the emissions of any air contaminant, except motor vehicles.

(52) "Utility Distribution Company" means one of several organizations that control energy transmission and distribution in California. Utility Distribution Companies include, but are not limited to, the Pacific Gas and Electric Company, the San Diego Gas and Electric Company, Southern California Edison, Los Angeles Department of Water and Power, the Imperial Irrigation District, and the Sacramento Municipal Utility District.

(53) "Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines (Verification Procedure)" means the ARB regulatory procedure codified in title 13, CCR, sections 2700-2710, which is incorporated herein by reference, that engine manufacturers, sellers, owners, or operators may use to verify the reductions of diesel PM or NOx from in-use diesel engines using a particular emission control strategy.

(54) "Verified Diesel Emission Control Strategy" means an emission control strategy, designed primarily for the reduction of diesel PM emissions, which has been verified pursuant to the Verification Procedure.

NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013, Health and Safety Code. Reference: Sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

(e) Requirements

(1) Fuel and Fuel Additive Requirements for New and In-Use Stationary CI Engines That Have a Rated Brake Horsepower of Greater than 50

(A) As of January 1, 2005, except as provided for in subsection (c), all new stationary CI engines and all in-use stationary diesel-fueled CI engines shall use only:

1. CARB Diesel Fuel, or
2. an alternative diesel fuel that meets the requirements of the Verification Procedure, or
3. an alternative fuel, or
4. CARB Diesel Fuel used with fuel additives that meets the requirements of the Verification Procedure, or
5. any combination of (e)(1)(A)1. through (e)(1)(A)4. above.

(2) Operating Requirements and Emission Standards for New and In-Use Stationary Diesel-Fueled CI Engines That Have a Rated Brake Horsepower of Greater than 50 (>50 bhp).

(A) ***New Emergency Standby Diesel-Fueled CI Engine (>50 bhp) Operating Requirements and Emission Standards***

1. No new stationary emergency standby diesel-fueled CI engine (>50 bhp) located on school grounds shall operate for non-emergency use, including maintenance and testing purposes, when any school-sponsored activities are taking place.

2. No new stationary emergency standby diesel-fueled CI engine (>50 bhp) shall operate in response to the notification of an impending rotating outage, unless the following criteria are met:

   a. the engine's permit to operate allows operation of the engine in anticipation of a rotating outage, or the District has established a policy or program that authorizes operation of the engine in anticipation of a rotating outage; and

   b. the Utility Distribution Company has ordered rotating outages in the control area where the engine is located, or has indicated it expects to issue such an order at a specified time; and

   c. the engine is located in a control area that is subject to the rotating outage; and

   d. the engine is operated no more than 30 minutes prior to the time when the Utility Distribution Company officially forecasts a rotating outage in the control area; and

   e. the engine operation is terminated immediately after the Utility Distribution Company advises that a rotating outage is no longer imminent or in effect.

3. As of January 1, 2005, except as provided in subsection (c), no person shall sell, offer for sale, purchase, or lease for use in California any stationary emergency standby diesel-fueled CI engine that has a rated brake horsepower greater than 50 unless it meets the following applicable emission standards, and no person shall operate any new stationary emergency standby diesel-fueled CI engine that has a rated brake horsepower greater than 50, unless it meets all of the following applicable operating requirements and emission standards which are summarized in Table I:

a. Diesel PM Standard and Hours of Operating Requirements

I. General Requirements: New stationary emergency standby diesel-fueled engines (>50 bhp) shall:

i. emit diesel PM at a rate less than or equal to 0.15 g/bhp-hr; or
ii. meet the current model year diesel PM standard specified in the Off-Road Compression Ignition Engine Standards for off-road engines with the same horsepower rating (Title 13 CCR section 2423), whichever is more stringent; and
iii. not operate more than 50 hours per year for maintenance and testing purposes. This subsection does not limit engine operation for emergency use and for emission testing to show compliance with (e)(2)(A)3.

II. Consistent with section 39666(d) of the Health and Safety Code, the District may allow a new emergency standby diesel-fueled CI engine (> 50 hp) to operate up to 100 hours per year for maintenance and testing purposes on a site-specific basis, provided the diesel PM emission rate is less than or equal to 0.01 g/bhp-hr.

TABLE 1: SUMMARY OF THE EMISSION STANDARDS AND OPERATING REQUIREMENTS FOR NEW STATIONARY EMERGENCY STANDBY DIESEL-FUELED CI ENGINES > 50 BHP (SEE SUBSECTION (e)(2)(A)3.)

DIESEL PM				OTHER POLLUTANTS
DIESEL PM STANDARDS (g/bhp-hr)	MAXIMUM ALLOWABLE ANNUAL HOURS OF OPERATION FOR ENGINES MEETING DIESEL PM STANDARDS			HC, NOx, NMHC+NOX, AND CO STANDARDS (g/bhp-hr)
	Emergency Use	Non-Emergency Use		
		Emission Testing to show compliance[2]	Maintenance & Testing (hours/year)	
≤0.15[1]	Not Limited by ATCM[3]	Not Limited by ATCM[3]	50	Off-Road CI Engine Certification Standards for an off-road engine of the same model year and horsepower rating, or Tier 1 standards for an off-road engine of the same horsepower rating.[4]
≤0.01[1]	Not Limited by ATCM[3]	Not Limited by ATCM[3]	51 to 100 (Upon approval by the District)	

1. Or off-road certification standard (title 13 CCR section 2423) for an off-road engine with the same horsepower rating, whichever is more stringent
2. Emission testing limited to testing to show compliance with subsections (e)(2)(A)3.
3. May be subject to emission or operational restrictions as defined in current applicable district rules, regulations, or policies.
4. The option to comply with the Tier 1 standards is available only if no off-road engine certification standards have been established for an off-road engine of the same model year and brake horsepower rating as the new stationary emergency standby diesel-fueled CI engine.

b. HC, NOx, NMHC + NOx, and CO standards: New stationary emergency standby diesel-fueled CI engines (> 50 bhp) must meet the standards for off-road engines of the same model year and horsepower rating as specified in the Off-Road Compression-Ignition Engine Standards (title 13, CCR, section 2423). If no standards have been established for an off-road engine of the same model year and horsepower rating as the new stationary emergency standby diesel-fueled CI engine, then the new stationary emergency standby diesel-fueled CI engine shall meet the Tier 1 standards in title 13, CCR, section 2423 for an off-road engine of the same horsepower rating, irrespective of the new stationary emergency standby diesel-fueled CI engine's model year.

c. Consistent with section 39666(d) of the Health and Safety Code, the District:

I. may establish more stringent diesel PM, NMHC+NOx, HC, NOx, and CO emission rate standards; and
II. may establish more stringent maintenance and testing hour of operation standards on a site-specific basis; and
III. shall determine an appropriate limit on the number of hours of operation for demonstrating compliance with other District rules ~~and initial start-up testing~~.

(B) ***In-Use Emergency Standby Diesel-Fueled CI Engine (> 50 bhp) Operating Requirements and Emission Standards***

1. No in-use stationary emergency standby diesel-fueled CI engine may be operated in response to the notification of an impending rotating outage if the following criteria are met:

a. the engine's permit to operate allows operation of the engine in anticipation of a rotating outage, or the District has established a policy or program that authorizes operation of the engine in anticipation of a rotating outage; and

b. the Utility Distribution Company has ordered rotating outages in the control area where the engine is located, or has indicated it expects to issue such an order at a certain time; and

c. the engine is located in a control area that is subject to the rotating outage; and

d. the engine is operated no more than 30 minutes prior to the time when the Utility Distribution Company officially forecasts a rotating outage in the control area; and

e. the engine operation is terminated immediately after the Utility Distribution Company advises that a rotating outage is no longer imminent or in effect.

2. No in-use stationary emergency standby diesel-fueled CI engine (> 50 bhp) located on school grounds shall operate for non-emergency use, including for maintenance and testing purposes, when school activities are taking place.

3. Except as provided in subsection (c), all in-use stationary emergency standby diesel-fueled CI engines (> 50 hp) operated in California shall meet, in accordance with the applicable compliance schedules specified in subsections (f) and (g), the following requirements (which are summarized in Table 2):

TABLE 2: SUMMARY OF THE EMISSION STANDARDS AND OPERATING REQUIREMENTS FOR IN-USE STATIONARY EMERGENCY STANDBY DIESEL-FUELED CI ENGINES > 50 BHP (SEE SUBSECTION (e)(2)(B)3.)

DIESEL PM				OTHER POLLUTANTS
DIESEL PM STANDARDS (g/bhp-hr)	**MAXIMUM ALLOWABLE ANNUAL HOURS OF OPERATION FOR ENGINES MEETING DIESEL PM STANDARDS**			**HC, NOx, NMHC+NOX, AND CO STANDARDS (g/bhp-hr)**
	Emergency Use	**Non-Emergency Use**		
		Emission Testing to show compliance[1]	**Maintenance & Testing (hours/year)**	
Not limited by ATCM[2]	Not Limited by ATCM[2]	Not Limited by ATCM[2]	20	Both (i) and (ii) must be met:: (i) No increase in HC or NOx above 10% from baseline levels OR No increase in NMHC+NOx emissions above baseline levels (ii) No increase in CO above 10% from baseline levels
≤0.40	Not Limited by ATCM[2]	Not Limited by ATCM[2]	21 to 30	
≥ 0.40 and ≤ 0.15	Not Limited by ATCM[2]	Not Limited by ATCM[2]	31 to 50 (Upon approval by the District)	
≥ 0.15 and ≤ 0.01	Not Limited by ATCM[2]	Not Limited by ATCM[2]	51 to 100 (Upon approval by the District)	

1. Emission testing limited to testing to show compliance with subsections (e)(2)(B)3.
2. May be subject to emission or operational restrictions as defined in current applicable district rules, regulations, or policies.

a. Diesel PM Standard and Hours of Operation Limitations

I. General Requirements:

i. No in-use stationary emergency standby diesel-fueled CI engine (>50 bhp) that emits diesel PM at a rate greater than 0.40 g/bhp-hr shall operate more than 20 hours per year for maintenance and testing purposes. This section does not limit engine operation for emergency use and for emission testing to show compliance with (e)(2)(B)3.

ii. No in-use stationary emergency standby diesel-fueled CI engine (>50 bhp) that emits diesel PM at a rate less than or equal to 0.40 g/bhp-hr shall operate more than 30 hours per year for maintenance and testing purposes. This section does not limit engine operation for emergency use and for emission testing to show compliance with (e)(2)(B)3.

III. Consistent with section 39666(d) of the Health and Safety Code, the District may allow in-use stationary emergency standby diesel-fueled CI engines (> 50 bhp) to operate more than 30 hours per year for maintenance and testing purposes on a site-specific basis, provided the following limits are met:

i. Up to 50 annual hours of operation are allowed for maintenance and testing purposes if the diesel PM emission rate is less than or equal to 0.15 g/bhp-hr.

ii. Up to 100 annual hours of operation are allowed for maintenance and testing purposes if the diesel PM emission rate is less than or equal to 0.01 g/bhp-hr.

b. Additional Standards:

I. Owners or operators that choose to meet the diesel PM standards defined in subsection (e)(2)(B)3.a. with emission control strategies that are not verified through the Verification Procedure shall:

i. not increase HC or NOx emission rates by more than 10% above baseline, or
ii. not increase the sum of NMHC and NOx emission rates above baseline, and

iii. not increase CO emission rates by more than 10% above baseline.

c. Consistent with section 39666(d) of the Health and Safety Code, the District:

I. may establish more stringent diesel PM, NMHC+NOx, HC, NOx, and CO emission rate standards; and
II. may establish more stringent limits on hours of maintenance and testing on a site-specific basis; and
III. shall determine an appropriate limit on the number of hours of operation for demonstrating compliance with other District rules and initial start-up testing.

(C) ***New Stationary Prime Diesel-Fueled CI Engine (> 50 bhp) Emission Standards***

1. As of January 1, 2005, except as provided in subsection (c), no person shall sell, purchase, or lease for use in California a new stationary prime diesel-fueled CI engine that has a rated brake horsepower greater than 50 unless it meets the following applicable emission standards, and no person shall operate any new stationary prime diesel-fueled CI engine that has a rated brake horsepower greater than 50 that unless its meets all of the following emission standards and operational requirements (which are summarized in Table 3):

TABLE 3: SUMMARY OF THE EMISSION STANDARDS FOR NEW STATIONARY PRIME DIESEL-FUELED CI ENGINES > 50 BHP (SEE SUBSECTION (e)(2)(C)1.)

DIESEL PM STANDARDS (g/bhp-hr)	HC, NOx, NMHC+NOX, AND CO STANDARDS (g/bhp-hr)
Meet the more stringent of: ≤0.01[1] OR Off-Road CI Engine Certification Standard for an off-road engine of the same horsepower rating	Off-Road CI Engine Certification Standard for an off-road engine of the same model year and horsepower rating, or Tier 1 standard for an off-road engine of the same horsepower rating.[1,2]

1. May be subject to additional emission limitations as specified in current district rules, regulations, or policies governing distributed generation.
2. The option to comply with the Tier 1 standards is available only if no off-road engine certification standards have been established for an off-road engine of the same model year and brake horsepower rating as the new stationary emergency standby diesel-fueled CI engine.

a. Diesel PM Standard: All new stationary prime diesel-fueled CI engines (> 50 bhp) shall either emit diesel PM at a rate that is less than or equal to 0.01 grams diesel PM per brake-horsepower-hour (g/bhp-hr) or shall meet the current off-road PM certification standard for off-road engines of the same horsepower rating (title 13, CCR, section 2423), whichever is more stringent;

b. HC, NOx, NMHC+NOx, and CO Standards: All new stationary prime diesel-fueled CI engines (> 50 bhp) shall meet the standards for off-road engines of the same model year and horsepower rating as specified in the Off-Road Compression-Ignition Engine Standards (title 13, CCR, section 2423). If no limits have been established for an off-road engine of the same model year and horsepower rating as the new stationary prime diesel-fueled CI engine, then the new stationary prime diesel-fueled CI engine shall meet the Tier 1 standards in title 13, CCR, section 2423, for an off-road engine of the same horsepower rating, irrespective of the new stationary prime diesel-fueled CI engine's model year;

c. New stationary prime diesel-fueled CI engines that are used to provide electricity near the place of use (also known as "distributed generation") may be subject to additional emission limitations as specified in current district rules, policies, or regulations governing distributed generation;

d. Consistent with section 39666(d) of the Health and Safety Code, the District may establish more stringent diesel PM, NMHC+NOx, HC, NOx, and CO emission rate limits on a site-specific basis.

(D) ***In-Use Stationary Prime Diesel-Fueled CI Engine (> 50 bhp) Emission Standards***

1. Except as provided in subsection (c), all in-use stationary prime diesel-fueled CI engines (> 50 bhp) operated in California shall meet the following requirements (which are summarized in Table 4):

TABLE 4: SUMMARY OF THE EMISSION STANDARDS FOR IN-USE STATIONARY PRIME DIESEL-FUELED CI ENGINES > 50 BHP (SEE SUBSECTION (e)(2)(D)1.)		
DIESEL PM		OTHER POLLUTANTS
DIESEL PM STANDARDS (g/bhp-hr)		**HC, NOx, NMHC+NOX, AND CO STANDARDS (g/bhp-hr)**
Applicability	**Standard**	
All in-use prime engines (both off-road certified and not off-road certified)	85% reduction from baseline levels (Option 1) OR 0.01 g/bhp/hr (Option 2)	Both (i) and (ii) must be met: (i) No increase in HC or NOx emissions above 10% from baseline levels OR No increase in NMHC+NOx emissions above baseline levels (ii) No increase in CO above 10% from baseline levels
Only in-use prime engines NOTcertified in accordance with the Off-Road Compression Ignition Standards	30% reduction from baseline levels AND 0.01 g/bhp-hr by no later than July 1, 2011 (Option 3)	

a. Diesel PM Standards: All in-use stationary prime diesel-fueled CI engines (> 50 bhp) certified in accordance with the Off-Road Compression-Ignition Engine Standards (title 13, CCR, section 2423) shall comply with either option 1 or option 2 below. All engines not certified in accordance with the Off-Road Compression-Ignition Engine Standards (title 13, CCR, section 2423) shall comply with option 1, option 2, or option 3 below:

I. Option 1: Reduce the diesel PM emission rate by at least 85 percent, by weight, from the baseline level, in accordance with the appropriate compliance schedule specified in subsections (f) and (g),

II. Option 2: Emit diesel PM at a rate less than or equal to 0.01 g/bhp-hr in accordance with the appropriate compliance schedule as specified in subsections (f) and (g),

III. Option 3: Reduce the diesel PM emission rate by at least 30% from the baseline level, by no later than January 1, 2006, and emit diesel PM at a rate of 0.01 g/bhp-hr or less by no later than July 1, 2011.

b. Additional Standards:

I. Owners or operators that choose to meet the diesel PM limits defined in subsection (e)(2)(D)1.a. with emission control strategies that are not verified through the Verification Procedure shall:

i. not increase HC or NOx emission rates by more than 10% above baseline, or
ii. not increase the sum of NMHC and NOx emission rates above baseline, and
iii. not increase CO emission rates by more than 10% above baseline.

c. Consistent with section 39666(d) of the Health and Safety Code, the District may establish more stringent diesel PM, NMHC+NOx, HC, NOx, and CO emission rate standards.

(E) ***Emission Standards for New Stationary Diesel-Fueled CI Engines (> 50 bhp) Used in Agricultural Operations***

1. As of January 1, 2005, except as provided in subsection (c) and subsection (e)(2)(E)2., no person shall sell, purchase, or lease for use in California any stationary diesel-fueled engine to be used in agricultural operations that has a rated brake horsepower greater than 50, or operate any new stationary diesel-fueled engine to be used in agricultural operations that has a rated brake horsepower greater than 50, unless the engine meets all of the following emission performance standards (which are summarized in Table 5.):

TABLE 5: SUMMARY OF THE EMISSION STANDARDS FOR NEW STATIONARY DIESEL-FUELED CI ENGINES > 50 BHP USED IN AGRICULTURAL OPERATIONS (SEE SUBSECTION (e)(2)(E))

DIESEL PM	OTHER POLLUTANTS
DIESEL PM STANDARDS (g/bhp-hr)	**HC, NOx, NMHC+NOX, AND CO STANDARDS (g/bhp-hr)**
≤0.15[1] OR Off-Road CI Engine Certification Standard for an off-road engine of the same horsepower rating, whichever is more stringent.	Off-Road CI Engine Certification Standard for an off-road engine of the same model year and horsepower rating, or Tier 1 standard for an off-road engine of the same horsepower rating.[1]

1. Prior to January 1, 2008, these limits shall not apply to engines funded under State or federal incentive funding programs.

a. Diesel PM Standard: New agricultural stationary diesel-fueled CI engines shall emit no more than 0.15 g/bhp-hr diesel particulate matter (PM) limit or shall meet the current standards for off-road engines of the same horsepower rating as specified in the Off-Road Compression-Ignition Engine Standards (title 13, CCR, section 2423), whichever is lower; and

b. NMHC, NOx, and CO Standards: New agricultural stationary diesel-fueled CI engines shall meet the HC, NOx, (or NMHC+NOx, if applicable) and CO standards for off-road engines of the same model year and horsepower rating, as specified in the Off-Road Compression-Ignition Engine Standards (title 13, CCR, section 2423). If no limits have been established for an off-road engine of the same model year and horsepower rating as the new agricultural stationary diesel-fueled CI engine, then the new agricultural stationary diesel-fueled CI engine shall meet the Tier 1 standards in title 13, CCR, section 2423, for an off-road engine of the same horsepower rating, irrespective of the new agricultural diesel-fueled CI engine's model year.

2. Prior to January 1, 2008, the requirements of subsections (e)(2)(E)1. shall not apply to any stationary diesel-fueled CI engine that:

a. is used in agricultural operations, and

b. was funded under a State or federal incentive funding program, and

c. was sold for use in another agricultural operation, provided the stationary diesel-fueled CI engine complies with Tier II Off-Road Compression Ignition Standards for off-road engines of the same horsepower rating (title 13, CCR, section 2423).

For purposes of this subsection, State or federal incentive funding programs include, but are not limited to, California's Carl Moyer Program, as set forth in Title 17, Part 5, Chapter 9 of the California Health and Safety Code, and the U.S. Department of Agriculture's Environmental Quality Incentives (EQIP) Program, as set forth in Title 7, Chapter XIV, Part 1466 of the Code of Federal Regulations.

(3) <u>Emission Standards for New Stationary Diesel-Fueled CI Engines, Less Than or Equal to 50 Brake Horsepower (< 50 bhp).</u>

As of January 1, 2005, except as provided in subsection (c), no person shall sell, offer for sale, or lease for use in California any stationary diesel-fueled CI engine that has a rated brake horsepower less than or equal to 50, unless the engine meets the current Off-Road Compression-Ignition Engine Standards

(title 13, CCR, section 2423) for PM, NMHC+NOx, and CO for off-road engines of the same horsepower rating (These requirements are summarized in Table 6.)

TABLE 6 : SUMMARY OF THE EMISSION STANDARDS FOR STATIONARY DIESEL-FUELED CI ENGINES ≤ 50 BHP (SEE SUBSECTION (e)(3))
DIESEL PM STANDARDS, NMHC+NOX, AND CO STANDARDS (g/bhp-hr)
Current Off-Road CI Engine Certification Standard for an off-road engine of the same model year and horsepower rating.

(4) Recordkeeping , Reporting, and Monitoring Requirements

(A) Reporting Requirements for Owners or Operators of New and In-Use Stationary CI Engines, Including Non-Diesel-Fueled CI Engines, Having a Rated Horsepower Greater than 50 (> 50 bhp)

1. Except as provided in subsection (c) and subsection (e)(4)(A)5. below, prior to the installation of any new stationary CI engine (> 50 bhp) at a facility, each owner or operator shall provide the information identified in subsection (e)(4)(A)3. to the District APCO.

2. Except as provided in subsection (c) and subsection (e)(4)(A)5. below, and no later than July 1, 2005, each owner or operator of an in-use stationary CI engine (> 50 bhp) shall provide the information specified in subsection (e)(4)(A)3. to the District APCO.

3. Each owner or operator shall submit to the District APCO the following information for each new and in-use stationary CI engine (>50 bhp) in accordance with the requirements of subsections (e)(4)(A)1. and (e)(4)(A)2. above:

   a. Owner/Operator Contact Information
      I. Company name
      II. Contact name, phone number, address, e-mail address
      III. Address of engine(s)

b. Engine Information
   I. Make
   II. Model
   III. Engine Family
   IV. Serial number
   V. Year of manufacture (if unable to determine, approximate age)
   VI. Rated Brake Horsepower Rating
   VII. Exhaust stack height from ground
   VIII. Engine Emission Factors and supporting data for PM, NOx and NMHC separately or NMHC+NOx, and CO, (if available) from manufacturers data, source tests, or other sources (specify)

   IX. Control equipment (if applicable)
      i. Turbocharger
      ii. Aftercooler
      iii. Injection Timing Retard
      iv. Catalyst
      v. Diesel Particulate Filter
      vi. Other

c. Fuel(s) Used
   I. CARB Diesel
   II. Jet fuel
   III. Diesel
   IV. Alternative diesel fuel (specify)
   V. Alternative fuel (specify)
   VI. Combination (Dual fuel) (specify)
   VII. Other (specify)

d. Operation Information
   I. Describe general use of engine
   II. Typical load (percent of maximum bhp rating)
   III. Typical annual hours of operation
   IV. If seasonal, months of year operated and typical hours per month operated
   V. Fuel usage rate (if available)

e. Distance to nearest offsite receptor location

f. State whether the engine is included in an existing AB2588 emission inventory

4. Except as provided in subsection (c), and no later than 180 days prior to the earliest applicable compliance date specified in subsections (f)

or (g), each owner or operator of an in-use stationary diesel-fueled CI engine (> 50 bhp) shall provide the following additional information to the District APCO:

a. an identification of the control strategy for each stationary diesel-fueled CI engine that when implemented will result in compliance with subsections (e)(2). If applicable, the information should include the Executive Order number issued by the Executive Officer for a Diesel Emission Control Strategy that has been approved by the Executive Officer through the Verification Procedure.

5. The District APCO may exempt the owner or operator from providing all or part of the information identified in subsection (e)(4)(A)3. or (e)(4)(A)4. if there is a current record of the information in the owner or operator's permit to operate.

6. Upon the written request by the Executive Officer, the District APCO shall provide to the Executive Officer a written report of all information identified in subsections (e)(4)(A)3. and (e)(4)(A)4.

(B) Reporting Requirements for Sellers of New Emergency Standby or Stationary Prime Diesel-Fueled CI Engines (> 50 bhp) Sold To Agricultural Operations

1. Except as provided by subsection (c), by January 1, 2006 and January 1st of each year thereafter, any person who sells a stationary diesel-fueled CI engine having a rated brake horsepower greater than 50 for use in an agricultural operation shall provide the following information to the Executive Officer of the Air Resources Board:

a. Contact Information
   I. Seller's Company Name (if applicable);
   II. Contact name, phone number, e-mail address.

b. Engine Sales Information (for each engine sold for use in California in the previous 12 month calendar period).
   I. Make,
   II. Mode,
   III. Model year (if known),
   IV. Rated brake horsepower,
   V. Number of engines sold,
   VI. Certification executive order number (if applicable),
   VII. Engine family number (if known),
   VIII. Emission control strategy (if applicable).

(C) Reporting Requirements for Sellers of Stationary Diesel-Fueled CI Engines Having a Rated Brake Horsepower Less Than or Equal to 50 ($\leq$ 50 bhp)

1. Except as provided in subsection (c), by January 1, 2006 and January 1st of each year thereafter, all sellers of stationary diesel-fueled CI engines for use in California that have a rated brake horsepower less than or equal to 50 shall provide the following information to the Executive Officer of the Air Resources Board:

   a. Contact Information
      I. Sellers Company Name (if applicable);
      II. Contact name, phone number, e-mail address.

   b. Engine Sales Information (for each engine sold for use in California in the previous 12 month calendar period)
      I. Make,
      II. Model,
      III. Model year (if known),
      IV. Rated brake horsepower,
      V. Number of engines sold,
      VI. Certification executive order number (if applicable),
      VII. Engine family number (if known),
      VIII. Emission control strategy (if applicable).

(D) Demonstration of Compliance with Emission Limits

1. Prior to the installation of a new stationary diesel-fueled CI engine at a facility, the owner or operator of the new stationary diesel-fueled CI engine(s) subject to the requirements of section (e)(2)(A)3. or (e)(2)(C)1. shall provide emission data to the District APCO in accordance with the requirements of subsection (h) for purposes of demonstrating compliance.

2. By no later than the earliest applicable compliance date specified in subsections (f) or (g), the owner or operator of an in-use stationary diesel-fueled CI engine(s) subject to the requirements of subsection (e)(2)(B)3. or (e)(2)(D)1. shall provide emissions and/or operational data to the District APCO in accordance with the requirements of subsection (h) for purposes of demonstrating compliance.

(E) Notification of Non-Compliance

Owners or operators who have determined that they are operating their stationary diesel-fueled engine(s) in violation of the requirements specified

in subsections (e)(2) shall notify the district APCO immediately upon detection of the violation and shall be subject to district enforcement action.

(F) Notification of Loss of Exemption

1. Owners or operators of in-use stationary diesel-fueled CI engines, who are subject to an exemption specified in section (c) from all or part of the requirements of subsection (e)(2), shall notify the district APCO immediately after they become aware that the exemption no longer applies. No later than 180 days after notifying the APCO, the owner or operator shall demonstrate compliance with the requirements of subsection (e)(2). An owner or operator of an in-use stationary diesel-fueled CI engine(s) subject to the requirements of subsection (e)(2) shall provide emission data to the District APCO in accordance with the requirements of subsection (h) for purposes of demonstrating compliance.

2. The District APCO shall notify owners or operators of in-use stationary diesel-fueled CI engines, who are subject to the exemption specified in subsection (c)(9) from the requirements of subsections(e)(1) and (e)(2), when the exemption no longer applies. No later than 180 days after notification by the District APCO, the owner or operator shall demonstrate compliance with the requirements of subsections (e)(1) and (e)(2). An owner or operator of an in-use stationary diesel-fueled CI engine(s) subject to the requirements of subsection (e)(2) shall provide emissions data to the District APCO in accordance with the requirements of subsection (h) for purposes of demonstrating compliance.

(G) Monitoring Equipment

1. A non-resettable hour meter with a minimum display capability of 9,999 hours shall be installed on all engines subject to all or part of the requirements of subsection (e)(2).

2. All DPFs installed pursuant to the requirements in subsection (e)(2) must be installed with a backpressure monitor to notify the owner or operator when the high backpressure limit of the engine is approached.

3. Consistent with section 39666(d) of the Health and Safety Code, the District APCO may require the owner or operator to install and maintain additional monitoring equipment for the particular emission control strategy(ies) used to meet the requirements of subsection (e)(2).

(H) Reporting Provisions for Exempted Prime Engines

An owner or operator of an engine subject to subsections (c)(6), (c)(11), or (c)(12) shall keep records of the number of hours the engines are operated on a monthly basis. Such records shall be retained for a minimum of 36 months from the date of entry. Record entries made within 24 months of the most recent entry shall be retained on-site, either at a central location or at the engine's location, and made immediately available to the District staff upon request. Record entries made from 25 to 36 months from the most recent entry shall be made available to District staff within 5 working days from the district's request.

(I) Reporting Requirements for Emergency Standby Engines

1. Starting January 1, 2005, each owner or operator of an emergency standby diesel-fueled CI engine shall keep a monthly log of usage that shall indicate the following:

   a. emergency use hours of operation;
   b. maintenance and testing hours of operation;
   c. hours of operation for emission testing to show compliance with subsections (e)(2)(A)3. and (e)(2)(B)3.;
   d. initial start-up hours; and
   e. hours of operation for all uses other than those specified in subsections (e)(4)(I)1.a through (e)(4)(I)1.d. above.

2. Log entries shall be retained for a minimum of 36 months from the date of entry. Log entries made within 24 months of the most recent entry shall be retained on-site, either at a central location or at the engine's location, and made immediately available to the District staff upon request. Log entries made from 25 to 36 months from most recent entry shall be made available to District staff within 5 working days from request.

NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013, Health and Safety Code. Reference: Sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

(f) Compliance Schedule for Owners or Operators of Three or Less Engines

(1) Each in-use stationary diesel-fueled CI engine (> 50 bhp), which will meet the requirements of subsections (e)(2)(B) solely by maintaining or reducing the current annual hours of operation for maintenance and testing, shall be in compliance by no later than January 1, 2006.

(2) Each in-use stationary diesel-fueled CI engine (> 50 bhp), which is not subject to subsection (f)(1) but is required to meet the requirements of subsections (e)(2)(B) or (e)(2)(D), shall meet these requirements in accordance with the following schedule:

(A) All pre-1989 through 1989 model year engines, inclusive, shall be in compliance by no later than January 1, 2006;

(B) All 1990 through 1995 model year engines, inclusive, shall be in compliance by no later than January 1, 2007;

(C) All 1996 through 2007 model year engines, inclusive, shall be in compliance by no later than January 1, 2008; and

(D) All post-2007 model year engines shall comply with the requirements of this section applicable to their model years.

NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013, Health and Safety Code. Reference: Sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

(g) Compliance Schedule for Owners or Operators of Four or More Engines

(1) Each in-use stationary diesel-fueled CI engine (> 50 bhp), which will meet the requirements of subsections (e)(2)(B) solely by maintaining or reducing the current annual hours of operation for maintenance and testing, shall be in compliance by no later than January 1, 2006.

(2) Engines under common ownership or operation, that are subject to the requirements of subsections (e)(2)(B) or (e)(2)(D) and that are not required to meet the compliance date specified in (g)(1), shall comply with (e)(2)(B) or (e)(2)(D), whichever applies, according to the following schedule:

Pre-1989 Through 1989 Model Year Engines, Inclusive

Percent of Engines	Compliance date
25%	January 1, 2006
50%	January 1, 2007
75%	January 1, 2008
100%	January 1, 2009

1990 through 1995 Model Year Engines, Inclusive

Percent of Engines	Compliance date
30%	January 1, 2007
60%	January 1, 2008
100%	January 1, 2009

1996 and Later Model Year Engines	
Percent of Engines	Compliance date
50%	January 1, 2008
100%	January 1, 2009

NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013, Health and Safety Code. Reference: Sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

(h) Emissions Data

(1) Upon approval by the District APCO, the following sources of data may be used in whole or part to meet the emission data requirements of subsections (e)(2)(A) through (e)(2)(D):

(A) off-road engine certification test data for the stationary diesel-fueled CI engine,
(B) engine manufacturer test data,
(C) emissions test data from a similar engine, or
(D) emissions test data used in meeting the requirements of the Verification Procedure for the emission control strategy implemented.

(2) Emissions testing of a stationary diesel-fueled CI engine, for purposes of showing compliance with the requirements of subsections (e)(2)(A) through (e)(2)(D), shall be done in accordance with the methods specified in subsection (i).

(3) For purposes of emissions testing, the particulate matter (PM) emissions from a dual-fueled stationary CI engine, which uses as its fuel a mixture of diesel fuel and other fuel(s), shall be deemed to be 100% diesel PM.

(4) Emissions testing for the purposes of determining the percent change from baseline shall include baseline and emission control strategy testing subject to the following conditions:

(A) Baseline testing may be conducted with the emission control strategy in place, provided the test sample is taken upstream of the emission control strategy and the presence of the emission control strategy is shown to the District APCO's satisfaction as having no influence on the emission test results;

(B) Control strategy testing shall be performed on the stationary diesel-fueled CI engine with full implementation of the emission control strategy;

(C) The percent change from baseline shall be calculated as the baseline emissions minus control strategy emissions, with the difference being

divided by the baseline emissions and the result expressed as a percentage; and

(D) The same test method shall be used for determining both baseline emissions and control strategy emissions.

(5) Emission testing for the purposes of demonstrating compliance with an emission level shall be performed on the stationary diesel-fueled CI engine with the emission control strategy fully implemented.

NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013, Health and Safety Code. Reference: Sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

(i) Test Methods

(1) The following test methods shall be used to determine diesel PM, HC, NOx, CO and NMHC emission rates:

(A) Diesel PM emission testing shall be done in accordance with one of the following methods:

1. ~~California Air Resources Board Method 5 (ARB Method 5),~~ *Determination of Particulate Matter Emissions from Stationary Sources*, as amended July 28, 1997, which is incorporated herein by reference.

a. For purposes of this subsection, diesel PM shall be measured only by the probe catch and filter catch and shall not include PM captured in the impinger catch or solvent extract.

b. The tests are to be carried out under steady state operation. Test cycles and loads shall be in accordance with ISO-8178 Part 4 or alternative test cycle approved by the District APCO.

c. The District APCO may require additional engine or operational duty cycle data if an alternative test cycle is requested; or

2. International Organization for Standardization (ISO) 8178 Test procedures: ISO 8178-1:1996(E) ("ISO 8178 Part 1"); ISO 8178-2: 1996(E) ("ISO 8178 Part 2"); and ISO 8178-4: 1996(E) ("ISO 8178 Part 4"), which are incorporated herein by reference; or

3. Title 13, California Code of Regulations, section 2423, *Exhaust Emission Standards and Test Procedures –Off-Road Compression Ignition Engines*, which is incorporated herein by reference.

(B) NOx, CO and HC emission testing shall be done in accordance with one of the following methods:

1. California Air Resources Board Method 100 (ARB Method 100), *Procedures for Continuous Gaseous Emission Stack Sampling*, as amended July 28, 1997, which is incorporated herein by reference.

   a. Tests using ARB Method 100 shall be carried out under steady state operation. Test cycles and loads shall be in accordance with ISO-8178 Part 4 or alternative test cycle approved by the District APCO.

   b. The District APCO may require additional engine or operational duty cycle data if an alternative test cycle is requested; or

2. International Organization for Standardization (ISO) 8178 Test procedures: ISO 8178-1:1996(E) ("ISO 8178 Part 1"); ISO 8178-2: 1996(E) ("ISO 8178 Part 2"); and ISO 8178-4: 1996(E) ("ISO 8178 Part 4"), which are incorporated herein by reference; or

3. Title 13, California Code of Regulations, section 2423, *Exhaust Emission Standards and Test Procedures – Off-Road Compression Ignition Engines*, which is incorporated herein by reference.

(C) NMHC emission testing shall be done in accordance with one of the following methods:

1. International Organization for Standardization (ISO) 8178 Test procedures: ISO 8178-1:1996(E) ("ISO 8178 Part 1"); ISO 8178-2: 1996(E) ("ISO 8178 Part 2"); and ISO 8178-4: 1996(E) ("ISO 8178 Part 4"), which are incorporated herein by reference; or
2. Title 13, California Code of Regulations, section 2423, *Exhaust Emission Standards and Test Procedures –Off-Road Compression Ignition Engines*, which is incorporated herein by reference.

(2) Consistent with section 39666(d) of the Health and Safety Code, the District APCO may approve the use of alternatives to the test methods listed in subsection (i)(1), provided the alternatives are demonstrated to the APCO's satisfaction as accurate in determining the emission rate of diesel PM, HC, NOx, NMHC, or CO.

NOTE: Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, and 43013, Health and Safety Code. Reference: Sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, and 43013.

Appendix B

Stationary Emergency/Standby Diesel-Fueled Engine Survey

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I. Introduction and Background

In September 2002, the Air Resources Board (ARB or Board) conducted the Stationary Emergency/Standby Diesel-Fueled Engine Survey (survey or ES Survey). The intent of the survey was to obtain a representative sampling of the average number of hours that stationary emergency/standby diesel-fueled engines were operated in California for the purposes of maintenance and testing, interruptable service contracts (ISCs), and emergencies. The information gathered would enable us to determine how many engines would potentially be affected by the proposed airborne toxic control measures (ATCMs) for stationary compression-ignition engines and would also aid in enhancing our statewide inventory of stationary diesel-fueled engines.

Using contact information obtained from the local air quality management and air pollution control districts' (districts) permit data and the California Energy Commission's list of back-up generators, the survey was distributed to approximately 3,000 private companies and facilities and public entities, including county, city, state, and federal agencies throughout California. Surveys included a requested due date of September 30, 2002, or October 11, 2002 (survey recipients in the San Joaquin Valley received their package two weeks later, and therefore, were alloted more time). The survey was also available on the ARB web site and an e-mail notice was sent to the approximately 750 subscribers of the stationary diesel risk reduction e-mailing list. A copy of the cover letter and the actual survey can be found in Section IV of this Appendix.

More than 800 surveys were returned with data for approximately 3,200 engines, while 69 surveys were returned from facilities stating they do not currently have stationary emergency/standby diesel-fueled engines. The majority of the surveys that contained an explanation cited changes in facility operation as the reason for the change in engine status.

The stationary emergency/standby diesel-fueled engine survey requested engine owners/operators to submit the following information for each applicable engine:

- engine make (manufacturer)
- model
- horsepower rating
- model year
- approximate age (if model year unknown)
- actual annual hours of operation for 1999 through 2001 for each purpose:
  - maintenance and testing
  - interruptable service contract
  - emergencies

In requesting the survey, the ARB stated that specific survey responses or the names of businesses would not be published but that the data from the survey would be analyzed

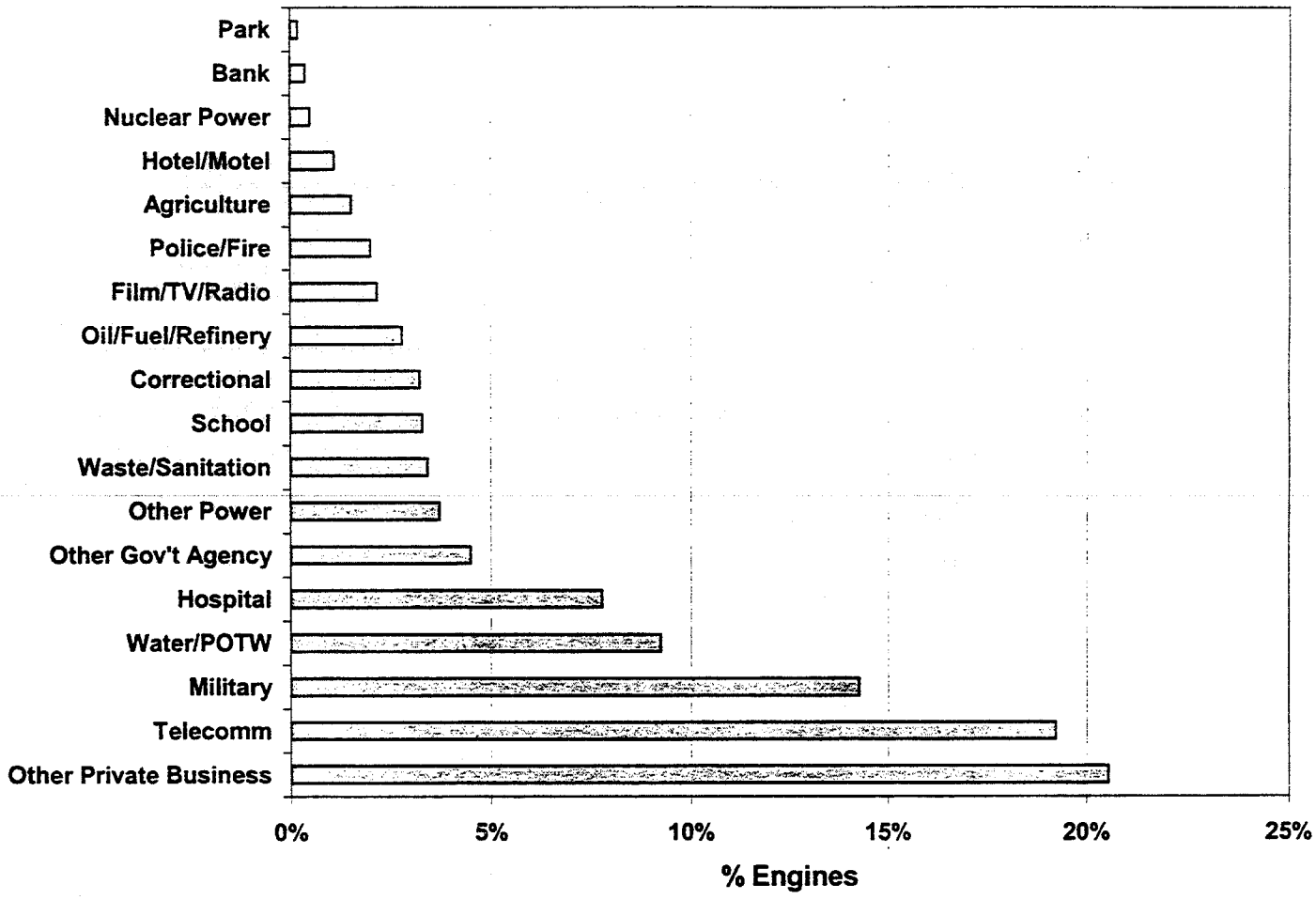
and discussed in public workshops and reports. A brief summary of staff's initial survey analysis was presented at a public workshop in November 2002.

The 3,200 engines included in the returned surveys represent approximately 17 percent of the current estimated stationary emergency/standby diesel-fueled engine statewide inventory. Information regarding the statewide inventory can be found in Chapter IV.

II. Survey Response

As stated in section I, the ES Survey was distributed to approximately 3,000 private and public entities. Figure B-1 below shows the types of facilities that responded to the survey and their corresponding response rates.

Figure B-1: Facility Survey Responses



The "Other Private Businesses" category in the chart above includes building property management companies, retail stores, and many other miscellaneous business types. The "Agriculture" category includes food growing and production facilities, wineries, and meat processing facilities. Of the total responses, 50 percent were from private companies/facilities, 42.5 percent were from public agencies (county, city, state, and federal), and 7.5 percent (248 engines) were undetermined. Of the 248 undetermined facility engines, 188, or 76 percent, were from hospitals. Since survey respondents supplied facility names only, staff were not always able to determine if the hospitals were public or private facilities.

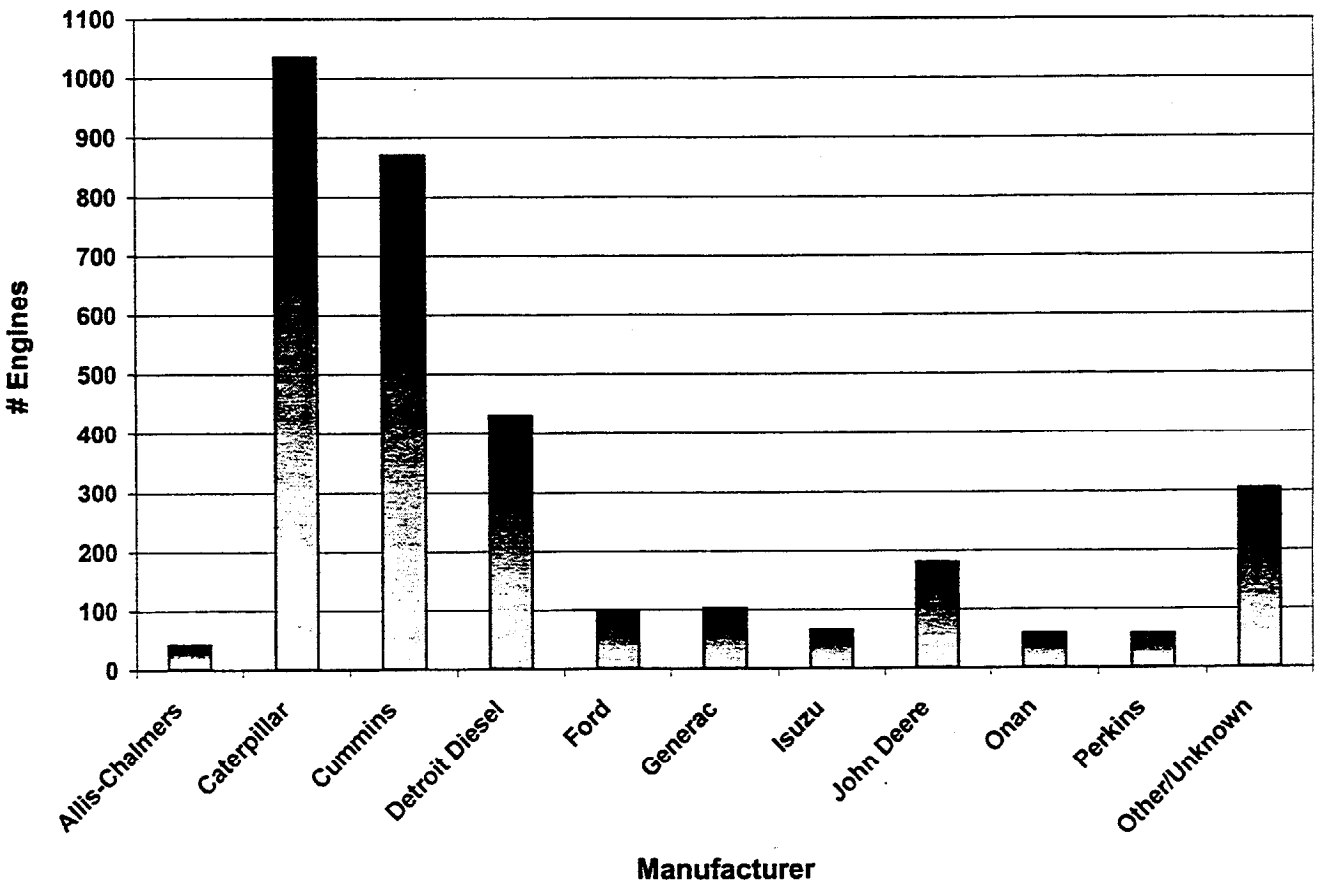
III. Survey Results

The figures and tables in this section represent the results of the key data fields from the ES Survey. Not all records had data for every field, so null values were not included in averages or population numbers.

A. Engine Manufacturers

As shown in Figure B-2 below, the most prominent engine manufacturers of stationary diesel-fueled engines from the ES Survey were Caterpillar and Cummins, comprising 32 and 27 percent of the engines, respectively. Included in the "Other/Unknown" category were manufacturers that represented less than 40 engines each, such as Waukesha, White, Kohler, General Motors, Hino, Mitsubishi, Volvo, Komatsu, to name a few. The "Other/Unknown" category comprised nine percent of the engines. It is also important to note that it is possible that some survey respondents included the name of the backup generator manufacturer as opposed to the engine manufacturer.

Figure B-2: Engine Manufacturers



B. Horsepower and Model Year

Table B-1 shows the number of engines listed in specific horsepower ranges. The ranges correlate to those used in the stationary diesel-fueled engine statewide inventory. The largest number of the engines from the survey were within the 251 to 500 horsepower range, the average and median ratings were 604 and 360 horsepower, respectively. Our survey targeted engines greater than or equal to 50 horsepower, so while we received some data for the smaller engines, they were not included in the table at right or in the average or median horsepower ratings.

Table B-1: Horsepower Ranges

HP Range	# Engines
51-120	592
121-175	332
176-250	317
251-500	632
501-750	375
751-1000	222
>1000	575
Total	*3,045*

Since the stationary diesel-fueled engine statewide inventory groups engines by both model year and horsepower, Tables B-2 and B-3 below show the survey engine population for the same horsepower ranges and model year ranges used in the inventory. Table B-2 displays the engines by model year while Table B-3 displays the engines by horsepower. There were 561 engines rated over 50 horsepower that did not have model year or age data, while only 101 engines had no horsepower data.

Table B-2: Model Year and Horsepower Ranges (by Horsepower)

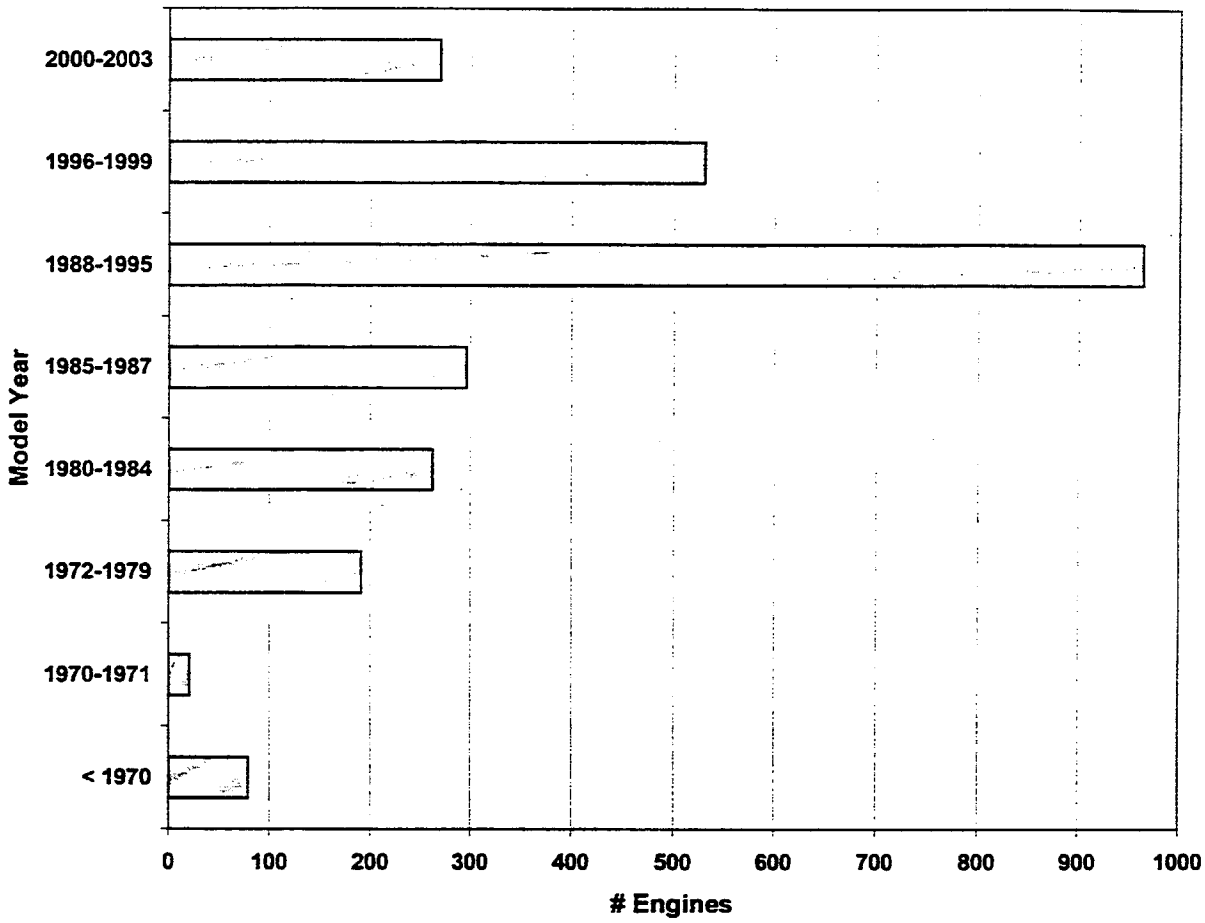
Model Year Range	No HP Data	51-120	121-175	176-250	251-500	501-750	751-1000	>1000
No Age Data		206	44	38	79	83	23	88
< 1970	6	7	15	18	12	9	3	9
1970-1971	2	2	-	-	10	-	2	5
1972-1979	8	23	16	23	36	32	15	34
1980-1984	12	34	29	27	57	35	28	39
1985-1987	10	50	35	37	88	30	24	22
1988-1995	29	162	111	99	204	108	63	177
1996-1999	20	72	53	52	100	48	40	137
2000-2003	14	36	29	23	46	30	24	64

Table B-3: Model Year and Horsepower Ranges (by Model Year)

HP Range	No Age Data	< 1970	1970-1971	1972-1979	1980-1984	1985-1987	1988-1995	1996-1999	2000-2003
No HP Data		6	2	8	12	10	29	20	14
51-120	206	7	2	23	34	50	162	72	36
121-175	44	15	-	16	29	35	111	53	29
176-250	38	18	-	23	27	37	99	52	23
251-500	79	12	10	36	57	88	204	100	46
501-750	83	9	-	32	35	30	108	48	30
751-1000	23	3	2	15	28	24	63	40	24
>1000	88	9	5	34	39	22	177	137	64

Figure B-3 below shows the number of engines in each model year range. The average engine age was 12 years and the median age was 10 years.

Figure B-3: Engine Distribution by Model Year



As shown in the figure above, the largest model year group was 1988-1995, making up 37 percent of all of engines for which age or model year data was received.

C. Hours of Operation

The ES Survey requested actual hours of operation for three calendar years (1999 through 2001) for each of the following purposes: maintenance and testing, interruptable service contracts (ISC), and emergencies. Hours of operation data was received for 3,038 engines and the averages are presented in Table B-4. The data shows that stationary emergency/standby diesel-fueled engines operate approximately 31 hours per year on

Table B-4: Average Hours of Operation

Activity	Year		
	1999	2000	2001
Maintenance & Testing	22	22	21
Interruptable Service Contract*	1	3	4
Emergency/Standby	6	6	8
Total	29	31	33
Avg. Total	31		

* Includes all engines that reported hours of operation data for any purpose.

average. The majority of those hours (approximately 77 percent) are for maintenance and testing, while only about 20 percent of the annual hours are for actual emergency operation.

Table B-5: Reported ISC Hours

	Year		
	1999	2000	2001
# Engines	77	165	198
Total # Engines**	236		
Max Hours	543.6	2160.8	210
Average Hours	8.06	27.79	39.77
Overall Average	25.82		

** The total number of engines that reported ISC hours during at least one of the years (1999-2001).

For ISCs, the averages given are for all engines that have reported hours of operation. Since there are very few engines that indicated any hours of operation for an ISC program (about 8 percent), the average hours for ISC in Table B-4 are low. Table B-5 shows the data for engines that specifically reported ISC hours. As the table indicates, there was an increase in the number of ISC hours for each year. The increase from 1999 to 2000 was 245 percent and from 2000 to 2001, the increase was 43 percent. However, not all engines experienced an increase from one calendar year to the next (see Table B-6).

Table B-6: Increase in ISC Hours

Year	Engines with Increase in Hours	
	#	%
1999 to 2000	131	56%
2000 to 2001	147	62%
1999 to 2001	164	69%

While an emergency/standby engine's primary purpose is to provide service in the event of an emergency, such situations generally do not arise often, so the average annual hours of emergency operation are low. Table B-7 shows the number of engines that reported emergency/standby hours of operation and the average annual hours. Over the three-year period, the average annual operation for emergency/standby purposes was 7 hours.

Table B-7: Emergency/Standby Hours

Year	# Engines	% Engines	Average Hours
1999	998	33%	5.84
2000	1091	36%	6.45
2001	1251	41%	8.44

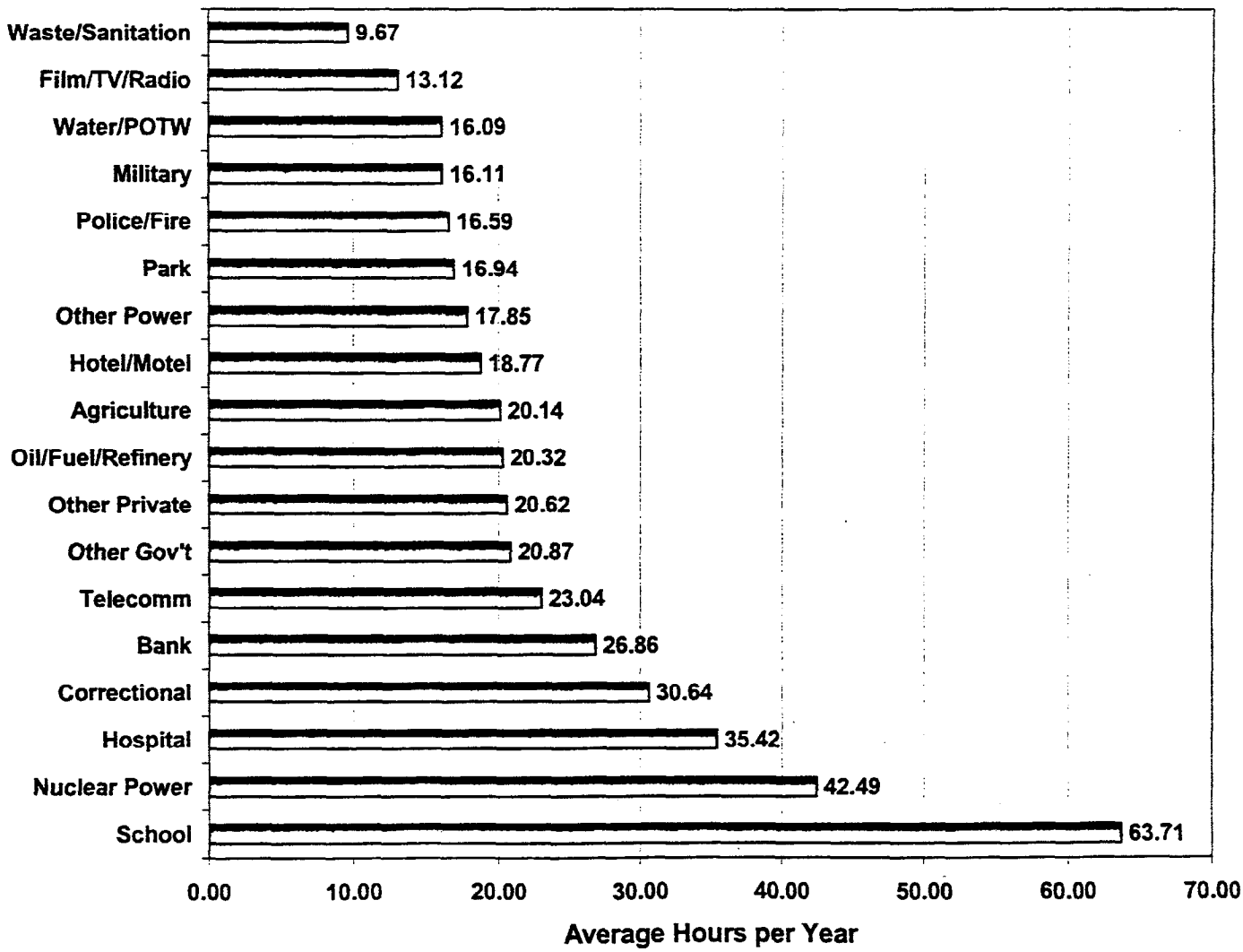
Although maintenance and testing hours comprise 77 percent of the average annual emergency/standby engine use, 95 percent of the engines run for 50 hours per year or less on average for that purpose. Table B-8 shows the percentages for 10, 20, 30, 40, and 50 hours per year.

Table B-8: Maintenance and Testing Average Hours Per Year

	Average Hours per Year				
	≤ 50	≤ 40	≤ 30	≤ 20	≤ 10
# Engines	2883	2880	2605	1632	927
% Engines	95%	92%	86%	54%	30.5%

Depending on the type of facility, maintenance and testing hours can vary. The required amount of hours that emergency/standby engines are tested each year are usually mandated by either legislation and/or facility, company, or corporate policy. Figure B-4 indicates the three-year average annual maintenance and testing hours of operation for each facility type identified.

Figure B-4: Average Annual Maintenance & Testing Hours by Facility Type



Engines operated by public agencies were run, on average, 21 hours per year for maintenance and testing, and private facilities had an average operation of 22 annual hours. For all engines included in the survey, the overall average maintenance and testing hours were 21.7 hours per year. It is important to note that the four facility types above that averaged more than 30 hours per year were schools, nuclear power plants, hospitals, and correctional facilities. Schools, which averaged almost 64 hours per year, comprised only three percent of the engines from the survey, nuclear power plants comprised one percent, hospitals comprised eight percent, and correctional facilities comprised eight percent, for a combined total of 15 percent.

IV. Survey Package

'nston H. Hickox
gency Secretary

Air Resources Board

Alan C. Lloyd, Ph.D.
Chairman
1001 I Street • P.O. Box 2815 • Sacramento, California 95812 • www.arb.ca.gov

Gray Davis
Governor

September 10, 2002

Dear Madam/Sir:

Air Resources Board Survey on Stationary Emergency/Stand-by Diesel-Fueled Engines

We are writing to ask you to fill out the enclosed Air Resources Board (ARB) survey on stationary emergency/stand-by diesel-fueled engines. The short survey asks about the engines' make, model, age, and how many hours the engines were operated (actual hours of operation, not permitted hours) each year for the past three years. Below are answers to some questions you may have regarding the survey.

Why is the ARB requesting this information?

We are currently developing an airborne toxic control measure (ACTM) to control particulate matter emissions from stationary diesel-fueled engines. The survey responses will give us up-to-date information on annual hours of operation for emergency/stand-by engines. We will use the information to identify and evaluate the impacts of emission reduction strategies for emergency/stand-by engines.

Does the ARB have the legal authority to request the survey information?

Yes. State law authorizes the ARB to request and gather the information required to determine if measures are needed to protect the public health from toxic air contaminants.

What if my business/facility does not have any emergency/stand-by engines?

Simply include your business/facility contact information, check-mark the box at the top of the form, and return it to us.

What will the ARB do with my survey?

We will enter the information into a database for analysis. The results of this analysis may be discussed at future workshops and summarized in our technical documents. However, we will not publish your survey responses or the name of your business in our documents.

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our Website: http://www.arb.ca.gov.

When does the ARB need my survey?

Please return your survey by September 30, 2002. You may either fax it to us at (916) 327-6251, or mail it to the following address:

California Air Resources Board
Attn: SSD/EAB
P.O. Box 2815
Sacramento, CA 95812-2815

Who should I contact if I have questions regarding the survey?

You may contact Mr. Alex Santos at (916) 327-5638 or via e-mail at asantos@arb.ca.gov, or Ms. Lisa Williams at (916) 327-1498 or via e-mail at lwilliam@arb.ca.gov.

We would like to thank you in advance for responding to this survey.

Sincerely,

/s/

Daniel E. Donohoue, Chief
Emissions Assessment Branch

Enclosure

cc: Mr. Alex Santos
Air Resources Engineer
Emissions Assessment Branch

Ms. Lisa Williams
Air Resources Technician
Emissions Assessment Branch

California Air Pollution Control Officers Association

Cal nia Environmental Protection Agency

Air Resources Board

Business/Facility Name: _____

Address: _____

City: _____ Zip: _____

Contact Name: _____ Phone: ( ) _____

Stationary Emergency/Stand-by Diesel-Fueled Engine Survey

☐ If your business/facility does not have any emergency/stand-by engines, please mark this box, fill in the contact information above, and return this form to us.

☐ If you are a "small business" (annual gross receipts of $10,000,000 or less per Cal. Gov. Code Sec. 14837(d)(1)), please mark this box.

Instructions:

1. Please fill in your contact information above.
2. Please limit your responses to stationary diesel-fueled emergency/stand-by engines only. An emergency/stand-by engine is any engine used only when normal power or natural gas service fails (i.e., back-up generators), for emergency purposes (i.e., fire pumps, water pumps for flood relief, etc.), or for participation in interruptable load programs (i.e., during periods of fuel or energy shortage in order to minimize or decrease the scale or duration of power outages).
3. Please only indicate the approximate age of the engine if you do not know the model year.
4. Please fax this survey to **(916) 327-6251**, or mail it to the address on the back of this form.

Permit # (if permitted)	Engine Make	Engine Model	Horse-power	Model Year (if known)	Approx Age	Hours Operated Year **1999**			Hours Operated Year **2000**			Hours Operated Year **2001**		
						Maint / Testing	Emerg / Standby	Other*	Maint / Testing	Emerg / Standby	Other*	Maint / Testing	Emerg / Standby	Other*
Example	*Cummins*	*3451D*				*142*	*84*	*26*	*105*	*96*	*0*	*200*	*173*	*15*

* If engine were operated for the purpose of participating in interruptable load programs, please write "ILP" next to the number in this box.

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Appendix C

Stationary Prime Diesel-Fueled Engine Survey

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I. Introduction and Background

In March 2003, the Air Resources Board (ARB or Board) conducted the Stationary Prime Diesel-Fueled Engine Survey (survey or Prime Survey). The survey was again conducted in June 2003 for facilities/companies residing within the Bay Area Air Quality Management District. The intent of the survey was to obtain a representative sampling of how stationary prime diesel-fueled engines are operated in California and the applications for which they operated. The information gathered would enable us to determine how many engines would potentially be affected by the proposed airborne toxic control measure (ATCM) for stationary compression-ignition engines and would also aid in enhancing our statewide inventory of stationary diesel-fueled engines.

Using contact information obtained from the local air quality management and air pollution control districts' (districts) permit data, the survey was distributed to approximately 560 private companies and facilities and public entities, including county, city, state, and federal agencies throughout California. The Prime Surveys distributed in March included a requested due date of April 11, 2003, and those distributed in June requested a return date of June 30, 2003. The survey was also available on the ARB web site and an e-mail notice was sent to the approximately 750 subscribers of the stationary diesel risk reduction e-mailing list. A copy of the cover letter and the actual survey can be found in Section IV of this Appendix.

As of this writing, 59 Prime Surveys were returned with data for 171 diesel-fueled engines. Several surveys were received for engines that use natural gas as a fuel, and those were not included in our survey analysis.

The Prime Survey requested engine owners/operators to submit the following information for each applicable engine:

- engine location (address)
- engine make (manufacturer)
- model
- serial number
- model year
- rated horsepower
- control equipment (i.e., diesel particulate filter, oxidation catalyst, etc.)
- fuel type
- fuel usage rate (i.e., number of gallons per week, month, or year)
- application or general use
- typical load
- average total hours operated per year
- normal hours of operation

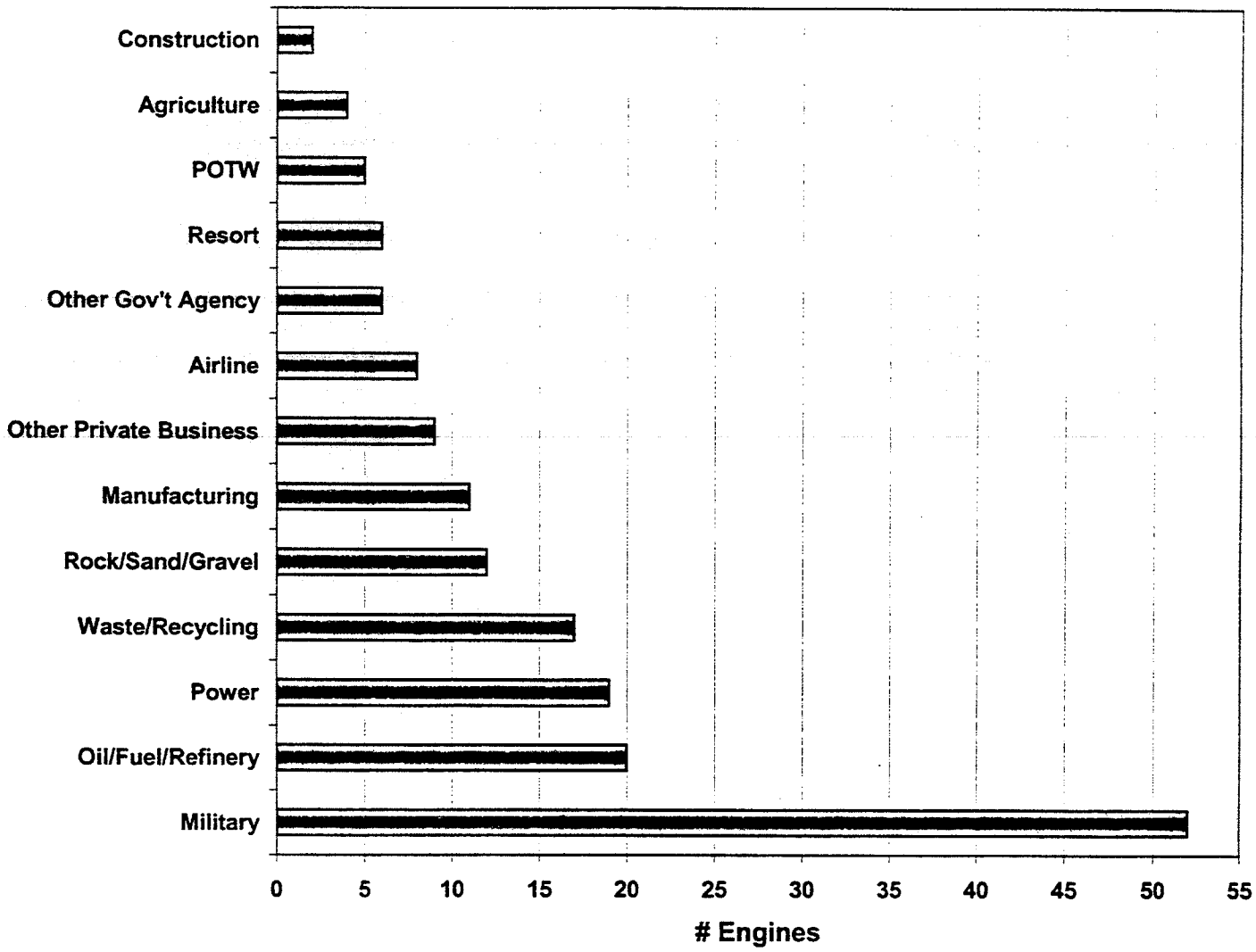
In requesting the survey, the ARB stated that specific survey responses or the names of businesses would not be published but that the data from the survey would be analyzed and discussed in public workshops and reports.

The 171 engines included in the returned surveys represent approximately __ percent of the current estimated stationary prime diesel-fueled engine statewide inventory. Information regarding the statewide inventory can be found in Chapter __.

II. Survey Response

As stated in section I, the Prime Survey was distributed to 560 private and public facilities. Figure C-1 below shows the types of facilities that responded to the survey and their corresponding response rates.

Figure C-1: Facility Survey Responses



The "Waste/Recycling" category includes landfills and garbage collecting or sorting facilities as well as recycling centers. The "Other Private Businesses" includes auto wrecking facilities, shipping container facilities, and other miscellaneous business types. The "Agriculture" category includes food growing and production facilities, wineries, and meat processing facilities. Of the total responses, 63 percent were from private companies/facilities and 37 percent were from public agencies (county, city, state, and federal).

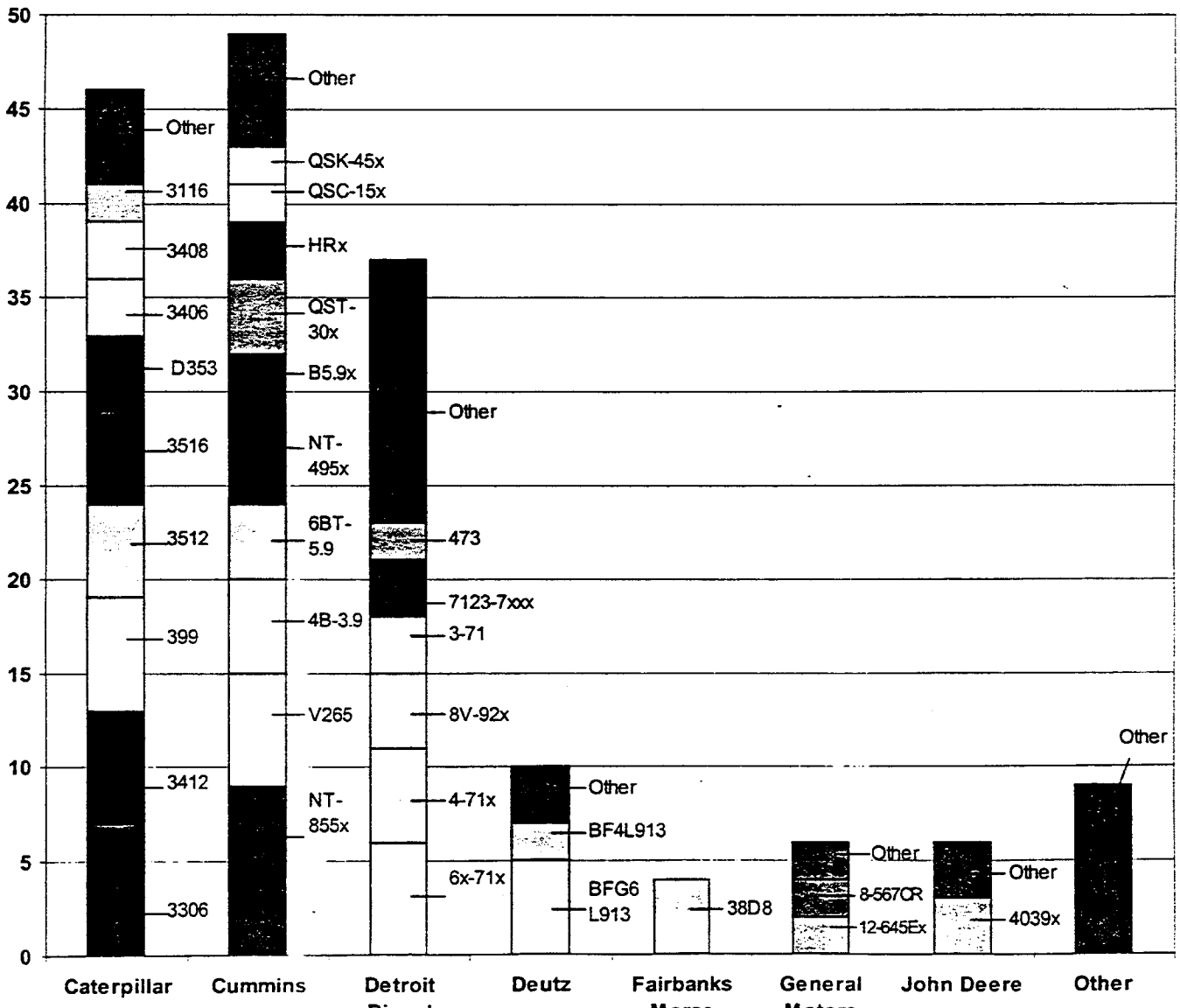
III. Survey Results

The figures and tables in this section represent the results of the key data fields from the Prime Survey. Not all records had data for every field, so null values were not included in averages or population numbers.

A. Engine Manufacturers

As shown in Figure C-2, the most prominent engine manufacturers of stationary diesel-fueled engines from the Prime Survey were Caterpillar, Cummins, and Detroit Diesel, totaling 77 percent of the engines. Engine models varied significantly and are also presented in the chart below. Included in the "Other/Unknown" category were manufacturers that represented fewer than 4 engines each, such as Case, Allis-Chalmers, Isuzu, and Perkins, to name a few. The "Other/Unknown" category comprised approximately eight percent of the engines.

Figure C-2: Engine Manufacturers and Models



B. Applications and Location

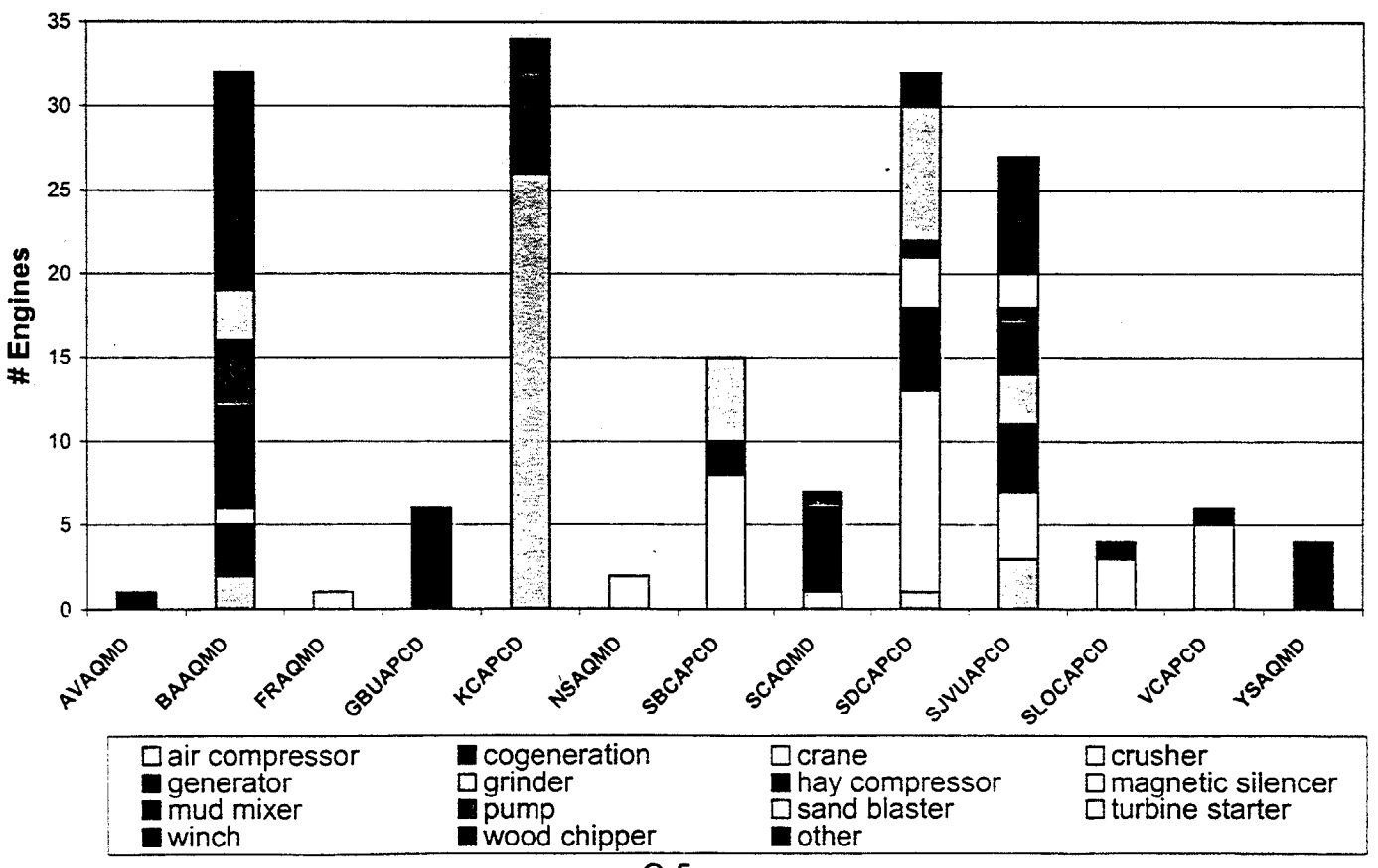
As shown in Figure C-2, the types of facilities that use stationary prime engines vary greatly. There are also a wide variety of applications for which prime engines are used. Table C-1 lists the number of engines in each application. Similar applications were sometimes grouped into a single category (i.e., rock crushers, concrete crushers, and jaw crushers were grouped under "crushers"). The "other" category includes single engine applications (such as blower, hydraulic pipe press, and lab knock engine, to name a few), that could not be easily grouped into specific categories.

Figure C-3 shows the applications as they are distributed throughout the districts. Not all districts are represented, since survey data was not received for engines in every district. Therefore, the chart below is not necessarily representative of the distribution of stationary prime engines throughout the State.

Table C-1: Applications

HP Range	# Engines
air compressor	6
cogeneration	3
crane	26
crusher	11
generator	56
grinder	3
hay compressor	4
magnetic silencer	3
mud mixer	3
pump	13
sand blaster	2
turbine starter	16
winch	3
wood chipper	7
other	15

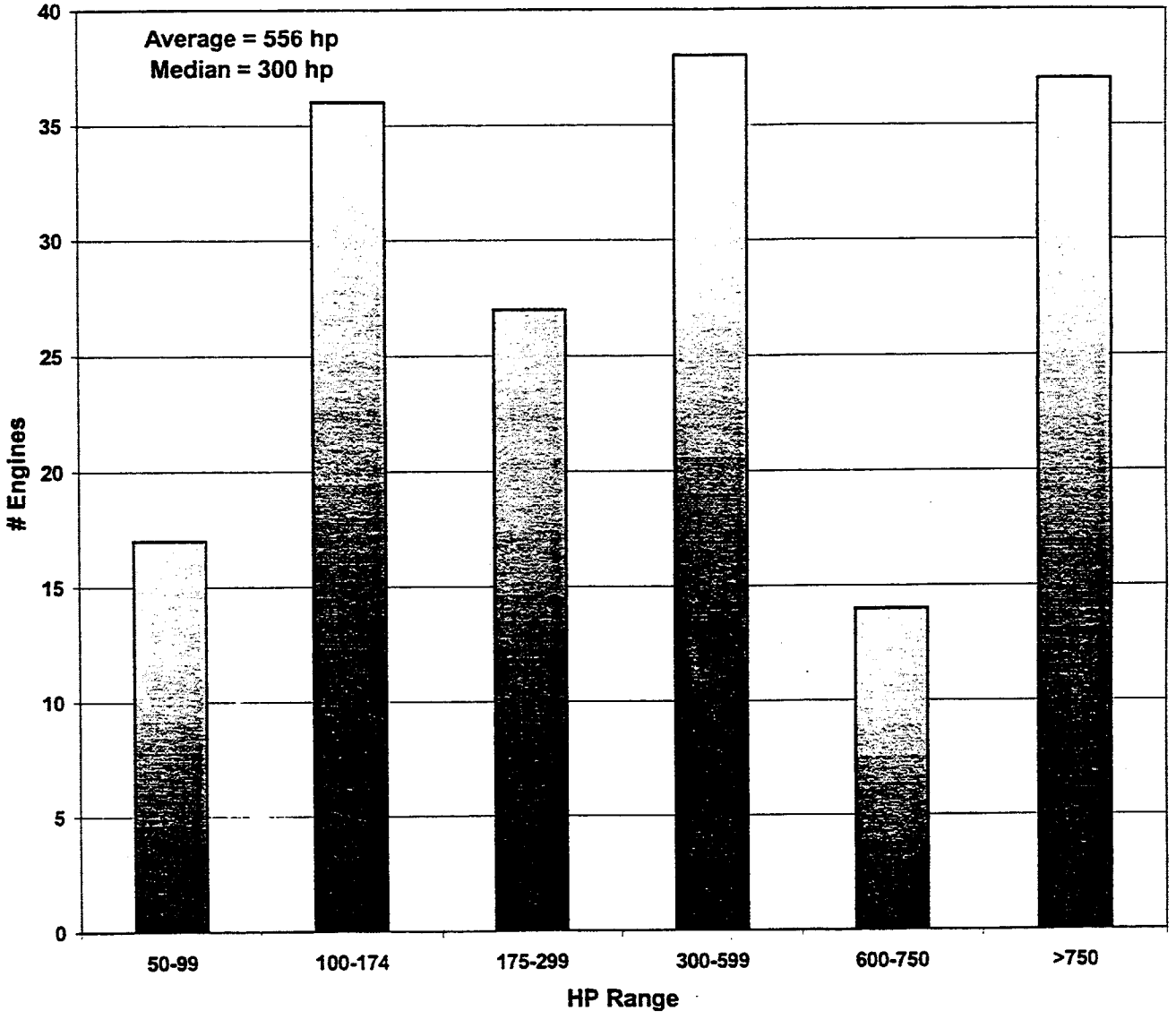
Figure C-3: Engine Applications by District



C. Horsepower and Model Year

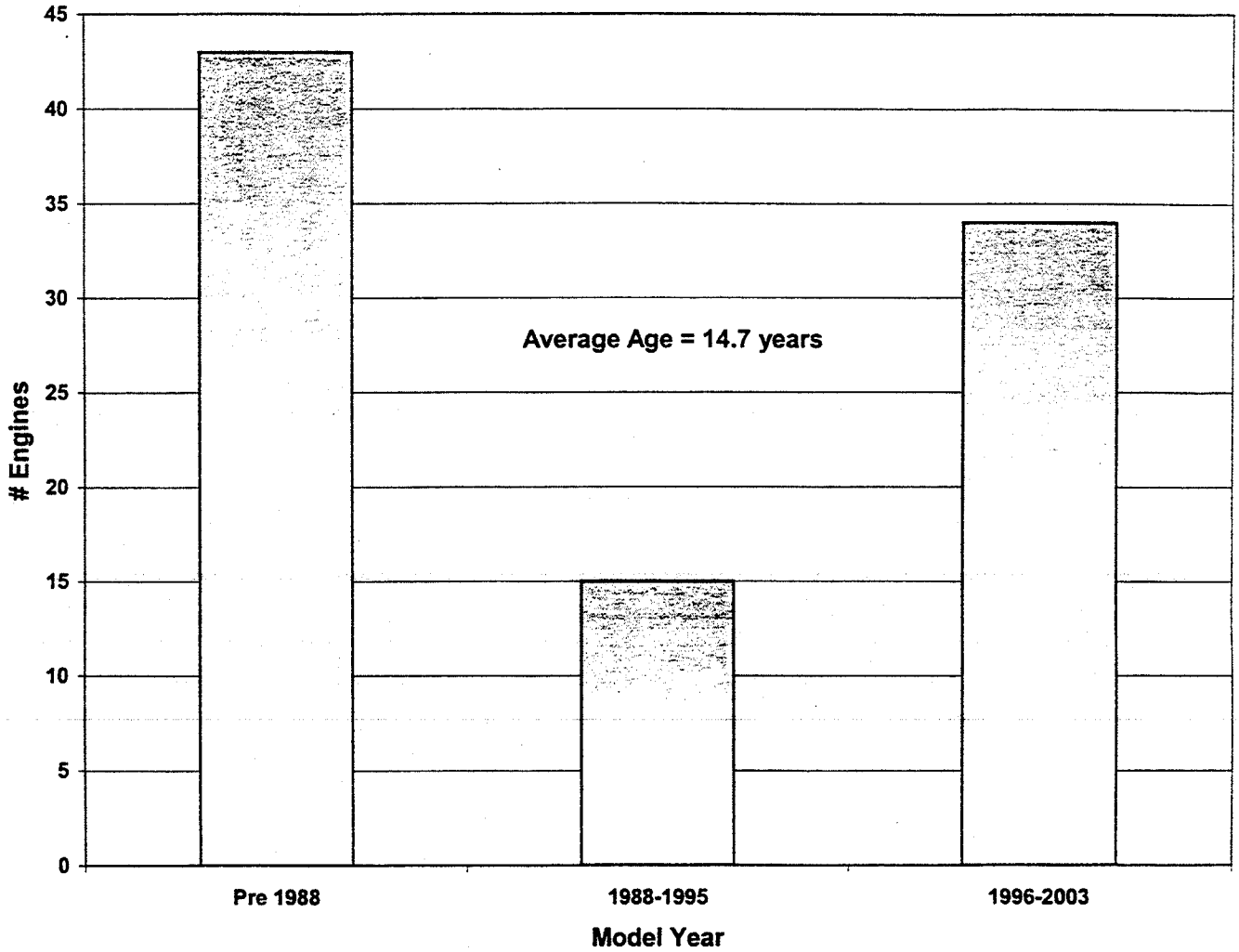
Figure C-4 shows the number of Prime Survey engines in each specified horsepower range. The engines ranged from under 50 horsepower to over 2,000 horsepower. The most populated categories were 300 to 599 horsepower, greater than 750 horsepower, and 100 to 174 horsepower, representing 66 percent of the survey engines. Our survey targeted engines greater than or equal to 50 horsepower, so while we received some data for the smaller engines, they were not included in the figure below or in the average or median horsepower ratings.

Figure C-4: Horsepower Ranges



Model year data was received for 92 of the 171 engines and sorted into three model year groups: pre-1988, 1988 to 1995, and 1996-2003. The corresponding data is presented in Figure C-5.

Figure C-5: Model Year Distribution



Tables C-2 and C-3 show the survey engine population for horsepower ranges based on their corresponding model year ranges. Table C-2 displays the engines by horsepower while Table C-3 displays the engines by model year. There were 78 engines rated over 50 horsepower that did not have model year data, while only one engine had no horsepower data.

Table C-2: Model Year and Horsepower Ranges (by Horsepower)

Age Range	Total	No HP Data	50-99	100-174	175-299	300-599	600-750	>750
No Age Data			8	26	14	13	3	14
1996-2003	34		5	8	1	8	4	8
1988-1995	15			2	4	4	4	1
pre-1988	43	1	4		8	13	3	14

Table C-3: Model Year and Horsepower Ranges (by Model Year)

HP Range	Total	No Age Data	1996-2003	1988-1995	pre-1988
No HP Data					1
50-99	17	8	5		4
100-174	36	26	8	2	
175-299	27	14	1	4	8
300-599	38	13	8	4	13
600-750	14	3	4	4	3
>750	37	14	8	1	14

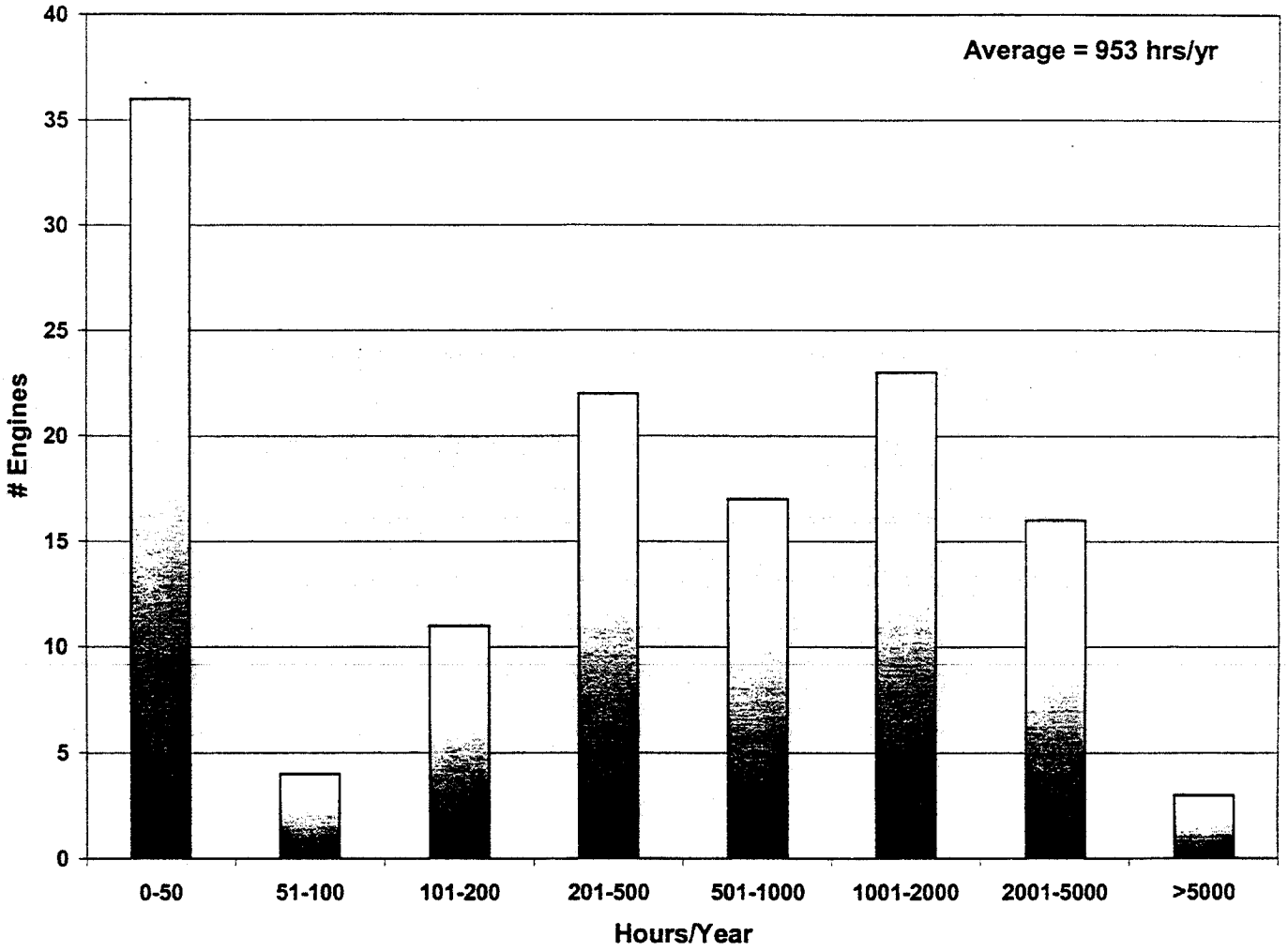
D. Hours of Operation

The Prime Survey requested the average total hours of annual operation for each engine. Hours for prime engines can vary from a few hours per year to several thousand and can also vary based on the type of application. The average number of annual hours reported from the surveys was 953, with 132 engines reporting hours of operation data. More than 61 percent of all engines had annual hours exceeding 200 per year, while 27 percent were operated 50 hours or less per year. Table C-4 shows the average annual hours for each application, while the survey-wide hours of operation data is presented in Figure C-6.

Table C-4: Average Hours of Operation by Application

Application	Average Annual Hours
air compressor	334
cogeneration	5501
crane	1024
crusher	1114
generator	1563
grinder	798
hay compressor	1482
magnetic silencer	8
mud mixer	517
pump	46
sand blaster	313
turbine starter	22
winch	<50
wood chipper	869
other	852

Figure C-6: Hours of Operation Ranges



E. Emission Controls

Approximately 52 percent of the engines responding to the survey have some kind of emission controls, most aiming to reduce NOx, such as ignition timing retard (ITR), fuel injection, and turbocharging and aftercooling and Selective Catalytic Reduction (SCR). While ITR reduces NOx emissions by shortening the time available for combustion and lowering cylinder temperature and pressure, it generally increases HC, CO, PM , and fuel consumption for the same reasons. ITR is usually used in conjunction with other strategies (such as turbocharging and aftercooling) to counteract those increases. Several engines had particulate matter (PM) control technologies, such as diesel particulate filters (DPFs) and diesel oxidation catalysts (DOCs). Table C-5 shows the engines that reported DPFs, DOCs, and SCRs, which are the most effective emission control technologies commercially available for stationary compression-ignition engines.

Table C-5: DPFs, DOCs, and SCRs on Stationary Prime Engines

Application	Control	Hours/Yr
rock crusher	DOC	2500
wood chipper	DOC	2000
electric power generation	DPF	1000
electric power generation	DPF	614
TRU generator	DPF	1465
wood chipper	DPF, DOC	1000
gantry crane	DPF, SCR	2723
gantry crane	DPF, SCR	1075
gantry crane	DPF, SCR	2498
gantry crane	DPF, SCR	3761
gantry crane	DPF, SCR	3050
gantry crane	DPF, SCR	2948
electric power generation	SCR	1860
electric power generation	SCR	1860
electric power generation	SCR	1860
electric power generation	SCR	1860
electric power generation	SCR	1860
electric power generation	SCR	1860

IV. Survey Package

Winston H. Hickox
Agency Secretary

Air Resources Board

Alan C. Lloyd, Ph.D.
Chairman
1001 I Street • P.O. Box 2815 • Sacramento, California 95812 • www.arb.ca.gov

Gray Davis
Governor

March 17, 2003

Dear Madam/Sir:

Air Resources Board Survey on Stationary Prime Engines

We are writing to ask you to fill out the enclosed Air Resources Board (ARB) survey on stationary prime engines (those that are not used for emergency/stand-by purposes and remain in one location at the facility for more than 12 months). The short survey asks questions regarding the engine's location, specifications, fuel usage, application, and operational hours. Below are answers to some questions you may have regarding the survey.

Why is the ARB requesting this information?

We are currently developing an airborne toxic control measure (ACTM) to control particulate matter emissions from stationary diesel-fueled engines. The survey responses will give us up-to-date information on how the stationary prime engines are operated. We will use the information to identify and evaluate the impacts of emission reduction strategies for stationary diesel-fueled prime engines.

Does the ARB have the legal authority to request the survey information?

Yes. State law authorizes the ARB to request and gather the information required to determine if regulations are needed to protect the public health from toxic air contaminants.

What if my business/facility does not have any stationary prime engines?

Simply include your business/facility contact information, check-mark the box at the top of the form, and return it to us.

What will the ARB do with the completed survey?

We will enter the information into a database for analysis. The results of this analysis may be discussed at future workshops and summarized in our technical documents. However, we will not publish your survey responses or the name of your business in our documents.

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our Website: http://www.arb.ca.gov.

When does the ARB need your survey?

Please return your survey by April 11, 2003. You may either fax it to us at (916) 327-6251, or mail it to the following address:

California Air Resources Board
Attn: SSD/EAB
P.O. Box 2815
Sacramento, CA 95812-2815

The survey is also available in electronic format (Microsoft Word or Adobe Acrobat) on our website at http://www.arb.ca.gov/diesel/primesurvey.htm. Surveys completed electronically can be e-mailed to lwilliam@arb.ca.gov.

Who should I contact if I have questions regarding the survey?

You may contact Mr. Alex Santos at (916) 327-5638 or via e-mail at asantos@arb.ca.gov, or Ms. Lisa Williams at (916) 327-1498 or via e-mail at lwilliam@arb.ca.gov.

We would like to thank you in advance for responding to this survey.

Sincerely,

/s/

Daniel E. Donohoue, Chief
Emissions Assessment Branch

Enclosure

cc: Mr. Alex Santos
Air Resources Engineer
Emissions Assessment Branch

Ms. Lisa Williams
Air Resources Technician
Emissions Assessment Branc

California Environmental Protection Agency

Air Resources Board

Business/Facility Name: _____

Address: _____

City: _____ Zip: _____

Contact Name: _____ Phone: (___) _____

E-mail Address: _____

Stationary Prime Engine Survey

☐ If your business/facility does not have any prime engines, please mark this box, fill in the contact information above, check any boxes that apply, and return this form.

☐ If you are a "small business" (100 employees or less and annual gross receipts of $10,000,000 or less per Cal. Gov. Code Sec. 14837(d)(1)), please mark this box.

☐ If you have visited our website (http://www.arb.ca.gov/diesel/dieselrrp.htm) or are aware of our activities regarding stationary diesel engines, please mark this box.

Instructions:

1. Please fill in your contact information above and check any applicable boxes.
2. Please limit your responses to stationary prime engines only. A stationary prime engine is any engine that is not used for emergency/stand-by purposes (i.e., is not a back-up generator, fire pump, etc.) and remains in one location at the facility for more than 12 months.
3. If the engine location is not a physical address, please specify approximate location (i.e., south end of Main Street in Bakersfield).
4. If the engine has emission control equipment installed, please use the following letters:
   A = Diesel Particulate Filter (DPF) C = Diesel Oxidation Catalyst (DOC) E = Turbo-Charged and/or After-Cooled
   B = Ignition Timing Retard (ITR) D = Selective Catalytic Reduction (SCR) F = Other – *please specify*
5. Please fax this survey to **(916) 327-6251**, or mail it to the address on the back of this form. If completing electronically, please e-mail to lwilliam@arb.ca.gov.

Permit # (if permitted)	Engine Location (address)	Engine Make	Engine Model	Serial #	Model Year	Rated Horse-power	Control Equip. (see #4 above)	Fuel Type	Fuel Usage Rate	Application (general use)	Typical Load (% of rated HP)	Average Total Hours Operated per Year	Normal Hours of Operation
Example	*123 Main St., Sacramento*	*Cummins*	*3451D*	*5Y45M -23F70*	*1985*	*750*	*E*	*Off-Road Diesel*	*10 gal per week*	*wood chipping*	*15 – 25%*	*1800*	*Mon-Fri 8am-5pm*

Printed on Re[illegible] Paper

Appendix D

Emissions Inventory Methodology

STATIONARY DIESEL ENGINES (Non-Agricultural Engines)

(Issued September 15, 2003)

EMISSION INVENTORY SUMMARY CATEGORY
Stationary Sources - Fuel Combustion

EMISSION INVENTORY CODES (CES CODES) AND DESCRIPTION
099-040-1200-0000 (89664) Stationary Non-Agricultural Engines - Diesel

EXECUTIVE SUMMARY

To support development of the Air Toxic Control Measure (ATCM) for stationary diesel engines, ARB staff worked with local air districts to develop a single statewide methodology and updated population and emission estimates for these engines. Equipment types considered include air compressors, prime and backup generators, prime and backup pumps, and other miscellaneous stationary diesel engines. Population and emission estimates for agricultural irrigation engines were not included in this methodology.

Based on this methodology, ARB estimates that in the year 2002 there were approximately 21,000 stationary diesel-fueled engines statewide. Backup generators was the most common stationary diesel equipment type (56%), followed by backup pumps (37%), prime generators (3%), prime pumps (2%), and others (1%). Air compressors were found to be primarily portable and therefore were a negligible stationary source category, both in terms of population and emissions. Allocation of engines to local air districts relied on human population as a surrogate. Consequently, over 85% of the statewide stationary diesel engine population was attributed to the following five districts: South Coast AQMD, Bay Area APCD, San Joaquin Valley Unified APCD, San Diego APCD, and Sacramento AQMD. We are aware that our district-specific estimates do not always agree with district estimates; however, this discrepancy will be addressed as the ATCM is implemented.

ARB estimates that in 2002, stationary diesel-fueled engines in California emitted 1.1 tons per day of diesel PM. In addition, those engines are estimated to have emitted 20.3 tons per day of oxides of nitrogen (NOx), 1.8 tons per day of reactive organic gases (ROG), and 6.9 tons per day of carbon monoxide (CO). Although backup engines make up over 50% of the stationary diesel engine population, they contribute less than 20% of the overall emissions due to their relatively low annual hours of operation. On the other hand, due to their relatively high number of hours of operation, prime generators and prime pumps are estimated to contribute the majority of stationary diesel engine emissions (35% and 23%, respectively). In the future, ARB estimates that the population of stationary diesel-fueled engines will increase at a rate roughly proportional to the rate of human population growth but that emissions will decrease due to the implementation of the stationary diesel ATCM.

BACKGROUND

In October 2000, the California Air Resources Board (ARB) published the Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-fueled Engines and Vehicles. That plan outlined a strategy for the reduction of diesel particulate matter (PM) by 75 percent by 2010 and by 85 percent by 2020. Sources of diesel PM include stationary sources, portable sources, on-road sources, and off-road sources (excluding the portable sources).

To meet the diesel PM emission reduction goals set forth in the diesel risk reduction plan, the ARB began the process of drafting air toxic control measures (ATCMs). ATCMs are regulatory in nature. Essential components of any regulation being developed are the cost effectiveness component and the regulatory effectiveness component. Essential to those components is a comprehensive and accurate emission inventory.

This methodology estimates the statewide population and emissions for stationary non-agricultural diesel engines, including air compressors, generators, pumps, and other types of equipment. Stationary engines associated with agricultural processes are not included in this emission estimation method. Estimation of the population and emissions from agricultural engines is described in an April 30, 2003 California Air Resources Board (ARB) memorandum entitled "Updated Statewide Population and Emission Inventory for Diesel-Fueled Agricultural Irrigation Pumps" (see Attachment G).

Stationary non-agricultural diesel engines are assumed to be engines that remain at a facility for at least 12 months, regardless of whether the engine is on wheels or a skid. Stationary diesel engines range in horsepower from less than 15 horsepower to over 3000 horsepower.

The stationary diesel engine inventory presented here is based upon reconciliation of district permit data for selected districts and Power Systems Research (PSR) data for all districts. The methodology allows the development of a more comprehensive and representative stationary diesel engine emission inventory, as additional data become available.

METHODS AND SOURCES

Engine Population

The population of stationary diesel engines was estimated for the following equipment types: air compressors, generators (prime and backup), pumps (prime and backup), and others (including crushers, grinders, cranes, and others).

The stationary diesel engine population was based on population estimates originally described in the ARB's OFFROAD model database of non-road mobile diesel engines. The OFFROAD population estimates were developed from nationwide engine sales data provided by PSR in 1996 and the ARB Stationary Source Division (SSD) Portable Equipment Database.

PSR is an independent research firm involved in research and development related to engine and engine component industries. The PSR database contains North American engine sales data compiled between 1989-1996 and reports engine populations by equipment type to the statewide level. The ARB staff estimated county-specific engine populations by spatially allocating the statewide PSR data using year 2002 county-specific human population data from the California Department of Finance (see Attachment A). The engine population for the year 2002 reported here was estimated using PSR 1996 engine population estimates that were grown to the year 2002 using growth and control surrogates found in the OFFROAD model.

The PSR database does not differentiate between mobile and stationary engines. To estimate the number of stationary diesel engines, mobile-stationary splits by horsepower class were applied to the overall inventory of diesel engines reported by PSR. These mobile-stationary splits, which are shown in Table 1 (page 3), are based on a report published by Booz-Allen & Hamilton in 1992.

Table 1

Distribution of Mobile and Stationary Diesel Engines

HP	Fraction Mobile	Fraction Stationary
	$Frac_{hp,\ ms}$	$Frac_{hp,\ ss}$
0-25	1	0
25-50	0.9	0.1
51-120	0.7	0.3
121-175	0.2	0.8
176-250	0.15	0.85
251-500	0.1	0.9
501-750	0.1	0.9
>750	0.1	0.9

Data Source: "Off-Road Mobile Equipment Emission Inventory Estimate", Booz Allen & Hamilton (BAH), January 1992

The majority of small horsepower diesel engines are assumed to be mobile while most large horsepower engines are assumed to be stationary. The OFFROAD model supplied the mobile diesel engine population estimates based

on the PSR database, and the relative fractions of stationary to mobile engines were used to estimate the stationary engine population. The resulting OFFROAD-PSR stationary diesel engine population is shown in Table 2 (page 4). A complete listing of this data, broken down by County, Air Basin, and District, is contained in Attachment D.

Table 2
2002 OFFROAD-PSR Statewide Diesel Engine Population

Equipment Type	Horsepower Class	Mobile	Stationary	Total
		$Frac_{hp,\,ms}$	$Frac_{hp,\,ss}$	$Frac_{hp,\,ms} + Frac_{hp,\,ss}$
Air Compressors	0 to 15	53	0	53
	16 to 25	109	0	109
	25 to 50	959	104	1063
	51 to 120	6413	2748	9161
	121 to 175	251	1005	1256
	176 to 250	345	1959	2304
	251 to 500	305	2744	3049
	501 to 750	13	112	125
	>750	4	32	36
Generator Sets	0 to 15	5214	0	5214
	16 to 25	3814	0	3814
	25 to 50	4663	520	5183
	51 to 120	7211	3088	10299
	121 to 175	291	1163	1454
	176 to 250	333	1888	2221
	251 to 500	442	3975	4417
	501 to 750	105	951	1056
	>750	105	951	1056
Pumps	0 to 15	3916	0	3916
	16 to 25	1170	0	1300
	25 to 50	2039	222	2265
	51 to 120	4002	1718	5717
	121 to 175	459	1835	2295
	176 to 250	176	1002	1176
	251 to 500	354	3183	3538
	>500	22	198	223
Other	0 to 15	2013	0	2013
	16 to 25	1615	0	1794
	25 to 50	4907	543	5452
	51 to 120	3770	1611	5386
	121 to 175	18	67	90
	Total	**55092**	**31619**	**86711**

Data Sources: Mobile ARB OFFROAD Model; Stationary - this methodology

Based on a telephone survey of local air districts, review of district permit data, and discussions with engine distributors, ARB staff concluded there are very few stationary diesel air compressors statewide and that the majority should be classified as portable equipment. Of the estimated statewide population of 8,452 air compressors shown in Table 2 (page 4), the ARB staff telephone survey found five air compressors that were considered stationary. These engines were left out of the horsepower reallocation described here because there were so few of them and they were specifically identified by location and size.

ARB conducted a similar telephone survey of district staff and reviewed district permit data to verify the numbers of "Other" engines that the PSR database assumed to be stationary (Table 2). The PSR data identified most of those engines as welders or pressure washers. The ARB survey indicated that the vast majority of those engines designated as "Others" were portable and should be designated as such. The revised numbers of "Other" engines is also reflected in Table 9 (page 17). The "Other" engine survey population was further split by county, air basin, and district using the Department of Finance human population data found in Attachment A. Like the air compressors, these engines were left out of the horsepower reallocation because there were so few of them and they were specifically identified by location and size.

In an effort to verify the stationary engine population estimates estimated using the OFFROAD-PSR database, the ARB staff compared the OFFROAD-PSR estimates with diesel engine permit information in local air district files. Since there is no comprehensive statewide permit database of stationary diesel engines, permit data from the following districts was solicited: Sacramento Metropolitan Air Quality Management District (SMAQMD), San Diego County Air Pollution Control District (SDCAPCD), San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD), and South Coast Air Quality Management District (SCAQMD). These districts were selected because they permit prime and back-up engines and their engine populations reflect a representative mix of urban and agricultural applications. Combined, these four districts represent approximately 58% of the stationary non-agricultural diesel engine population in California.

Table 3
Comparison of Stationary Diesel Engine

Horsepower Class	Permit Population	OFFROAD-PSR Database
0 -50	14	751
50 - 120	1425	3728
120 - 175	697	1779
175 - 250	667	1677
250 - 500	1118	4157
500 - 750	978	551
750 - 1000	740	669*
1000 - 1500	741	
1500 - 2000	322	
2000 - 3000	521	
>3000	18	
Total	7241	13312

Includes Sacramento, San Joaquin Unified, San Diego, and South Coast Districts

* 669 engines greater than 750 hp

Table 3 (page 5) compares the stationary engine population estimates by horsepower class developed for those four districts based on the OFFROAD-PSR database and district permit files. For the four districts considered, the total number of stationary non-agricultural diesel engines in district permit files (7,241 engines) is approximately 54% of the total number of engines predicted by the PSR data (13,312 engines) for those districts. The discrepancies between the district permit data and the OFFROAD-PSR population estimate varies based on the horsepower class considered. For engines less than 750 hp, permit files contain 4,899 engines or 39% of the 12,643 engines predicted by the

OFFROAD-PSR database. For engines greater than 750 hp, permit files contain 2,342 engines or three and one half times of the 669 engines predicted by the OFFROAD-PSR database.

District permit data indicates that the horsepower range distribution of the OFFROAD-PSR data does not represent the actual horsepower range distributions for stationary engines found in California, particularly for large engines. For example, the PSR data does not estimate engines greater than 750 horsepower but the available district permit data shows that at least 10 percent of permitted engines are greater than 750 horsepower. For this emission inventory update, the district permit data was assumed to be more representative of the numbers of large engines (greater than 750 hp), and the OFFROAD-PSR data were used to allocate smaller engines (less than 750 hp).

One of the shortcomings of the OFFROAD-PSR data is that it cannot be used to determine the principal way an engine is used, particularly generators and pumps. The OFFROAD-PSR data does not segregate generators and pumps into their prime and backup uses. Prime and backup engines are used in significantly different ways and therefore have different emission rates. The district permit data were used to address this issue and serve as a template to distribute the baseline populations of generators and pumps by principal usage.

To differentiate between prime and backup generators and pumps, the ARB staff analyzed district permit data and engine data from the California Energy Commission for the four districts listed above. Since the data for the Sacramento Metropolitan Air Quality Management District and the San Diego Air Pollution Control District was the most recent and complete, composite percentages were developed using the data from those two districts. The numbers of prime and backup engines were recorded for each district and totaled. That resulted in a ratio of five percent prime to ninety-five percent backup for both generators and pumps.

The ratio of the number of 750 hp or greater permitted engines to the total number of engines in the baseline database was used to split the original baseline population at 750 hp. This ratio was developed using only data from districts for which both permit and OFFROAD-PSR data was available (i.e. SMAQMD, SDCAPCD, SJVUAPCD, SCAQMD). The relative horsepower class ratios of baseline engines less than 750 hp (Table 4, page 7) and the relative horsepower class ratios of permitted engines greater than 750 hp (Table 5, page 7) were then used to further allocate engines amongst the horsepower classes for all districts. Tables 4 and 5 (page 7) show the horsepower classes and the ratios used to allocate the baseline population. The composite engine horsepower distribution is shown in Table 6 (page 8).

Table 4

OFFROAD-PSR Engine Population

Horsepower Class	Population	Total Engines	Percent of <750 hp Engines	Percent of All OFFROAD Engines
0 -50	742	742	4%	4%
50 - 120	4806	5548	25%	23%
120 - 175	2998	8546	15%	14%
175 - 250	2890	11436	15%	14%
250 - 500	7158	18594	37%	35%
500 - 750	951	19545	5%	5%
>750	1149	20694		6%

*Not including air compressors, pressure washers, welders

Table 5

District Permit Data*

Horsepower Class	Population	Total Engines	Percent of >750 hp Engines	Percent of All District Permit Engines
0 -50	14	14		0%
50 - 120	1425	1439		20%
120 - 175	697	2136		10%
175 - 250	667	2803		9%
250 - 500	1118	3921		15%
500 - 750	978	4899		14%
750 - 1000	740	5639	32%	10%
1000 - 1500	741	6380	32%	10%
1500 - 2000	322	6702	14%	4%
2000 - 3000	521	7223	22%	7%
>3000	18	7241	1%	0.249%

* Permit data not available for all districts.

Total Permitted Engines>750 hp = 2342
Engines in OFFROAD-PSR database for these Districts = 11349
2342/11349 = 20.636% of engines > 750 hp

Table 6					
Composite Engine Horsepower Distribution					
Horsepower Class	**Population**	**Total Engines**	**Percent of All Engines**	**Number of Engines**	**Percent of Engines**
0 -50	623	623	3.0%	16424	79%
50 - 120	4038	4662	19.5%		
120 - 175	2519	7181	12.2%		
175 - 250	2428	9610	11.7%		
250 - 500	6015	15624	29.1%		
500 - 750	799	16424	3.9%		
750 - 1000	1349	17773	6.5%	4270	21%
1000 - 1500	1351	19124	6.5%		
1500 - 2000	587	19711	2.8%		
2000 - 3000	950	20661	4.6%		
>3000	33	20694	0.2%		
Total	**20694**		**100%**	20694	100%

After engines were distributed among counties, equipment types, and horsepower ranges, they were allocated by age using the diesel engine age distribution shown in Attachment B. The age distribution for prime engines is identical to the one used in the ARB's OFFROAD model. For backup engines, analysis of district permit data indicated that backup engines tend to be in use much longer than prime engines. This analysis showed that backup engines can be up to 50 years old, and approximately 20% of backup engines are at least 20 years old. This information was used to adjust the age distribution for prime engines to create a composite age distribution for backup engines.

The population of stationary engines for a specific equipment type, horsepower range, and model year can be estimated using the following steps:

Step 1. This step is necessary to estimate the numbers of stationary engines based on the total number engines associated with the OFFROAD-PSR national engine population data.

$$Pop_{et,ss,dis} = Sum\ (Pop_{et,hp,ms,dis} * Frac_{hp,ss} / Frac_{hp,ms})$$

Where: $Pop_{et,\ ss,dis}$ = Stationary engine population for equipment type *et* in District *dis*.
$Pop_{et,hp,ms,dis}$ = Mobile engine population(from PSR database) for equipment type *et*, horsepower *hp* for District *dis*. (see Table 2, page 3)
$Frac_{ss,hp}$ = Fraction of engines of horsepower *hp* that are stationary (see Table 1, page 2)
$Frac_{ms,hp}$ = Fraction of engines of horsepower *hp* that are mobile (see Table 1, page 2)

Step 2. This step is necessary to estimate the numbers of engines by horsepower class.

$$Pop_{et,hp,ss,dis} = Pop_{et,ss,dis} * Frac_{hp}$$

Where: $Pop_{et,hp,ss,dis}$ = Stationary engine population for equipment type *et* of horsepower *hp* in District *dis.*
$Frac_{et,hp}$ = Fraction of horsepower class *hp* engines (from Table 6, page 7)

Step 3. This step is necessary to estimate the numbers of prime versus backup engines in each horsepower class.

$$Pop_{((pr,ba),hp,ss,dis)} = Pop_{et,hp} * Frac_{(pr,ba)}$$

Where: $Pop_{(pr,ba),hp,ss,dis}$ = Stationary engine population of either prime or backup engines for equipment type *et* of horsepower *hp* in District *dis.*
$Pop_{et,hp}$ = Total stationary engine population of given equipment type *et* and horsepower class *hp* (pumps or generators only)
$Frac_{(pr,ba)}$ = Fraction of either prime or backup equipment for given equipment type from district permit data

Step 4. This step is necessary to estimate the numbers of engines of a particular horsepower class that belong to a specific model year. Knowing the model year is essential to assigning emission factors for a specific subset of engines.

$$Pop_{et,my,ss,dis} = Pop_{et,by,hp,dis} * AD_{my}/100$$

Where: $Pop_{et,my,ss,dis}$ = Stationary engine population for equipment type *et,* model year *my* in District *dis.*
$Pop_{et,by,hp,dis}$ = Stationary engine population for equipment type *et,* base year *by*, horsepower class *hp* in District *dis.*
AD_{my} = Percent Age Distribution for model year *my* (from Attachment B).

Sample Calculations:

Population:

Population of 1988 model year backup generators between 250 and 500 horsepower in base year 2002, Los Angeles County, South Coast Air Basin, South Coast AQMD:

Step 1.

$$\mathbf{Pop_{et,hp,my,ss} = Sum(Pop_{et,hp,by,ms} * AD_{my} * Frac_{hp,ss} / Frac_{hp,ms})}$$

(see table 7 below, data from Attachment E, page D-19)

Table 7

OFFROAD-PSR Data for Generator Sets in Los Angeles County, South Coast Air Basin, South Coast AQMD					
Horsepower Class	$Pop_{et,hp,by,ms}$ (from Offroad-PSR database)	$Frac_{hp,ss}$ (from Table 1)	$Frac_{hp,ms}$ (from Table 1)	$Frac_{hp,ss}$/ $Frac_{hp,ms}$ (calculated)	$Pop_{et,hp,by,ss}$ (calculated)
0-25	2453	0	1	0.00	0
25-50	1267	0.1	0.9	0.11	141
50-120	1959	0.3	0.7	0.43	840
120-175	79	0.8	0.2	4.00	316
175-250	90	0.85	0.15	5.67	512
250-500	120	0.9	0.1	9.00	1081
500-750	29	0.9	0.1	9.00	257
>750	29	0.9	0.1	9.00	257
Total Generator Sets for Los Angeles County, South Coast Air Basin, South Coast AQMD					**3404**

Step 2.

$$\mathbf{Pop_{et,,hp,ss,dis} = Pop_{et,ss,dis} * Frac_{hp}}$$

$Pop_{et,ss,dis}$ =3404 (from step 1)

$Frac_{250\text{-}500}$ = 0.2906 (from Table 6, page 8)

$Pop_{et,et,hp,ss,dis}$ = 2842 * 0.2906= 989.4 generator sets between 250 and 500 hp

Step 3.

$$\mathbf{Pop_{(pr,ba)} = Pop_{et,} * Frac_{(pr,ba)}}$$

$Pop_{et,}$ =989.4 generator sets (from step 2)

$Frac_{(pr,ba)}$ = 0.95 backup generators (see text)

$Pop_{(pr,ba)}$ = 989.4 * 0.95 = 939.9 backup generators between 250 and 500 hp.

Step 4.

$$\mathbf{Pop_{et,my,ss,dis} = Pop_{by,et,hp,dis} * AD_{my}}$$

$Pop_{by,et,hp,dis}$ = 989 engines (from Step 3)

AD_{my} = 3.77% (value for 1988, from Attachment B)

$Pop_{et,my,ss,dis}$ = 989 * 3.77/100 = 37.28 backup generators, 1988 model year, in Los Angeles County, South Coast Air Basin

Emission Estimations

Activity Data

The average horsepower, load factor and activity (as a function of the annual hours of operation) vary by engine type and by horsepower range for each equipment type. Assumptions for each are shown in Attachment C.

"Average horsepower" is the average rated horsepower (assumed to be constant by calendar year) based on the assumption that the power demand for an equipment type does not change with time. The values used in this methodology are from the PSR database for engines less than 750 hp and from district permit data for engines greater than 750 hp.

"Load factor" is the average operation level for a given application expressed as a percent of the engine manufacturer's maximum horsepower rating. It has been assumed in the 1996 PSR database that engine type will operate at an average load factor. The load factor is used to adjust the maximum rated horsepower to horsepower levels under day-to-day operating conditions.

"Activity" is the measure of an engine type's average annual hours of operation. For most engine types, the 1996 PSR database is the source of engine activity data, but because there was no specific activity data available for prime and backup generators or pumps, ARB survey data described immediately below is used to estimate activities for backup generators and backup pumps.

The ARB conducted a number of surveys of District permitted engines to gather specific information about prime and backup engines operating in California. From these surveys, the ARB staff was able to develop activity data for prime generators and pumps, as well as backup generators and pumps. The annual activity for backup generators and pumps is assumed to be thirty (30) hours per year. The activity data for prime engines was also based on survey data. The annual activity for prime generators and prime pumps assumed to be 953 hours per year (the average for all prime engines responding to the ARB's survey of prime engine owner/operators). Attachment A shows the activities that were assigned to all equipment classes.

Emission Factors

Emission factors (Attachment D) were obtained from Appendix A of the ARB's OFFROAD Model Documentation (Reference 1). They are based on the U.S. Environmental Protection Agency's adopted diesel standards and reflect California regulations. These emission factors are for certified engines only, however; there is no requirement that commercial diesel engines meet certification requirements. Accordingly, it was assumed that when new engine standards come into effect, there will be low compliance level with certified engine emission standards, since purchasers of new commercial diesel engines can legally opt to buy uncertified engines. It was further assumed that as time

goes on, more and more new engines will meet the certified emission standard. Accordingly, the certified emission factors shown in Attachment D were weighted in such a manner that emission factors descend gradually rather descend suddenly when new emission standards are implemented.

The emission factors are composed of zero-hour (new equipment) emissions and deterioration rates. The emission factors can be expressed by the following equation:

$$EF_{et,hp,my,pol} = ZH_{et,hp,my,pol} + DR_{et,hp,my,\,pol} * CHrs_{et,hp}$$

Where: $EF_{et,hp,my,po}$ = emission factor, in grams per horsepower-hour (g/hp-hr) for equipment type *et,* horsepower *hp*, model year *my,* and pollutant *pol.*

$ZH_{et,hp,my,pol}$ = zero-hour emission rate, or when the equipment is new (g/hp-hr) for equipment type *et,* horsepower *h,* model year *my,* and pollutant *pol.*

$DR_{et,hp,my,\,pol}$ = deterioration rate, or the increase in ZH emissions as the equipment is used (g/hp-hr^2) for equipment type *et,* horsepower *hp*, model year *my,* and pollutant *pol.*

$CHrs_{et,hp}$ = cumulative hours, or total number of annual hours of use for equipment type *et,* horsepower *hp*, and model year *my.*

The zero-hour emission rates and the deterioration rates are shown in Attachment B. These factors vary by engine horsepower rating and model year only. They are the same factors used in the OFFROAD model for estimating emissions from non-road mobile diesel engines.

The cumulative hours of operation are calculated by multiplying the age of the engine (the model year) by the activity, or the number of hours per year that the engine operates. The activity varies by equipment type and is shown in Attachment A. The activities assumed for stationary diesel engines are the same as those assumed in the OFFROAD model for non-road mobile diesel engines.

Emissions per day are calculated using the following equation:

$$EMS_{TOTAL} = Sum(EMS_{et,hp,my})$$

Where:

et-equipment type (air compressors, generators, pumps, and other);
hp-horsepower range;
my-model years considered (1970 through 2002 (32 years total))

$$EMS_{et,hp,my} = EF_{et,hp,my} * HP_{et} * LF_{et,hp} * Activity_{et,hp} * CF * Pop_{et,hp,my}$$

Where:

$EMS_{et,hp,my}$ = amount of pollutant in tons per day (tons/day) for equipment type *et*, horsepower *hp*, and model year *my*.
$EF_{et,hp,my}$ = emission factor in grams per horsepower-hour (g/hp-hr) for equipment type *et*, horsepower *hp*, and model year *my*.
HP_{et} = Maximum rated average horsepower for equipment type *et*.
$LF_{et,hp}$ = Load factor for equipment type *et* and horsepower *hp*
$Activity_{et,hp}$ = annual activity in hours per year (hr/yr) for equipment type *et* and horsepower *hp*
CF = conversion factor to convert units of grams per year to tons per day
$Pop_{et,hp,my}$ = Number of engines of type *et*, horsepower *hp*, and model year *my*.

Sample Calculations:

Emission Factor:
Base Year 2002 NOx Emission Factor for backup generators between 250 and 500 horsepower, Model Year 1988, Los Angeles County, South Coast Air Basin, South Coast AQMD

$$EF_{et,hp,my,pol} = ZH_{et,hp,my,pol} + DR_{et,hp,my,pol} * CHrs_{et,hp}$$
$$CHrs_{et,hp} = (\text{Base Year} - \text{Model Year}) * \text{Activity}$$

Where: $ZH_{et,hp,my,pol}$ = zero-hour emission rate, in g/hp-hr = 11.0 g/hp-hr, 1987 factor (from Attachment D)
$DR_{et,hp,my,pol}$ = deterioration rate, in g/hp-hr = 0.000183 (from Attachment D)
Base Year = 2002
Model Year = 1988
Activity = 30 hours/year (from Attachment B)
$CHrs_{et,hp}$ = cumulative hours = (base year – model year)*Activity = (2002 – 1988=14 years) * 30 hours/year = 420 hours
EF = ZH + DR * CHrs = 11.0 + 0.000183 * 420 =
EF = **11.1 gm/hp-hr**

Emissions:
2002 NOx Emissions for backup generators between 250 and 500, Model year 1988, Los Angeles County, South Coast Air Basin, South Coast AQMD:

$$\mathbf{EMS_{et,hp,my} = EF_{et,hp,my} * HP_{et} * LF_{et,hp} * Activity_{et,hp} * CF * Pop_{et,hp,my}}$$

Where: $EF_{et,hp,my}$ = 11.1 gm/hp-hr (from above)
HP_{et} = 363 hp (from Attachment C)
$LF_{et,hp}$ = 0.74 (from Attachment C)
$Activity_{et,hp}$ = 30 hours/year (from Attachment C)
CF: 1 gram/year= (0.0000011 ton/year)/365 days/year = 3.0137E-09 tons/day
$Pop_{et,hp,my}$ = 37.3 engines (1988 model year, see above)

$EMS_{et,hp,my}$ = 11.1 gm/hp-hr * 363 hp * 0.74 * 30 hours/year * 3.0137E-09 ton/day * 37.3 engines

$EMS_{et,hp,my}$ = 0.0100 tons/year

Forecasting Population and Emissions to 2002
The year 2002 engine populations provided in this methodology were grown using the OFFROAD model, based on the 1996 PSR engine populations. The growth surrogates used in the OFFROAD model were obtained from a 1994 study by California State University, Fullerton (CSUF) entitled "A Study to Develop Projected Activity for Non-Road Mobile Categories in California, 1970-2020". For non-agricultural diesel engines, the surrogates used were a combination of projected employment growth and change in human population. The CSUF growth surrogates were used for all of the local air districts, with the exception of Bay Area Air Quality Management District and South Coast Air Quality Management District, who provided their own growth estimates.

Forecasting Population and Emissions Beyond 2002
Future year engine populations and emissions for the years 2010 and 2020 were estimated using the methodology set forth in the documentation for the OFFROAD model (Reference 6). The emissions projections provided in this methodology reflect both growth and control assumptions for future years. Because forecasted employment growth surrogates previously used were not available, county-specific human populations from the Department of Finance (DOF) were used as a growth surrogate in developing the stationary diesel engine populations. Based on the most recent DOF data, human population is projected to increase statewide at 1.7% per year between the years 2002 and 2020. Growth rates vary by county and this is reflected in the emission projections provided in this methodology. Control assumptions reflected in the emission projections include current federal and state emission standards.

The only exception to the growth scenarios is for South Coast AQMD. South Coast Rule 1110.2 establishes strict NOx emissions limits whose net effect is that no new prime diesel engines will be permitted in the South Coast AQMD beginning in 2003. In developing 2010 and 2020 emissions projections for the South Coast, it was therefore assumed that no new prime engines would enter the fleet between 2003 and 2020.

RESULTS

As shown in Table 9 (page 18), it is estimated there are 20,983 stationary non-agricultural diesel engines in California. Of these, the majority are backup generators and backup pumps (11,909 and 7,750 engines, respectively). Of the remaining stationary engines, 627 are prime generators, 408 are prime pumps, 5 are air compressors, and 284 are other (including crushers, grinders, cranes, turbine starters, and others). As shown in Table 10 (page 19), over 85% of the statewide stationary diesel engine population is found in the following five districts: South Coast AQMD, Bay Area APCD, San Joaquin Unified APCD, San Diego APCD, and Sacramento AQMD.

Emissions of ROG, NOx, PM, and CO by district and stationary diesel engine equipment type are shown in Table 11 (page 20). ROG, NOX, PM, and CO emissions from these engines are estimated to be 1.8, 20.3, 1.1, and 6.9 tons per day, respectively. The majority of the emissions occur in those districts with the largest stationary diesel engine populations. A detailed breakdown of engine population and emissions by district, air basin, county, equipment type, and horsepower class is provided in Attachment E.

Forecasted emissions for 2005, 2010, 2015, and 2020 are shown in Table 12 (page 21). Despite increases in the number of engines, emissions decline in future years due to the introduction of new emission controls for non-road engines by the US Environmental Protection Agency and the California Air Resources Board. Taking into account the growth and control assumptions described previously. Table 12 shows that emissions from nonagricultural stationary diesel engines are projected to decline by 58%, 46%, 49%, and 63% between the years 2005 and 2020 for ROG, NOX, CO, and PM, respectively. The percent emission reductions vary by equipment type because of South Coast AQMD rule 1110.2 (see above) and methodological differences in the development of the "other" equipment population.

We believe that the statewide total engine population and emissions estimates presented here are the most accurate possible based on data available at this time. We recognize that the district-specific engine population and emissions estimates presented in this methodology may not agree with those of the districts. This is due to the necessity of using county-specific human population as a spatial surrogate to allocate statewide engine populations to specific districts. We are aware that the current spatial surrogate does not reflect the possibility that rural areas may have a higher percentage of stationary diesel engines for a given population. Specifically, it is likely that our engine population estimates may be low for rural districts such as the Mojave Desert AQMD and high for urban districts such as the South Coast AQMD and the San Diego APCD. We intend to resolve the majority of the uncertainties and apparent discrepancies in the district-specific estimates as the Stationary Diesel ATCM is implemented and more detailed engine count data become available.

Table 8

"Other" Diesel Engine Population

District	Equipment	Horsepower Class	Engine Population
Bay Area AQMD	Other	120	19
		175	14
		250	13
		500	27
		750	21
		1000	3
		1500	7
		2000	4
		3000	6
Monterey Bay Unified APCD	Air Compressor	500	1
Northern Sierra AQMD	Crusher	120	1
		500	1
	Other	50	1
		120	1
		500	1
Placer County APCD	Turbine_Starter	500	1
Sacramento Metropolitan AQMD	Crusher	500	1
	Other	120	1
San Diego County APCD	Air Compressor	120	1
	Crane	500	4
	Crusher	750	1
	Grinder	500	1
	Other	120	4
		500	1
	Turbine_Starter	500	4
San Joaquin Valley Unified APCD	Air Compressor	120	2
		500	1
	Crusher	120	2
		175	2
		250	1
		500	7
		750	1
	Grinder	500	9
		750	1
		1000	2
	Other	120	8
		175	5
		250	1
South Coast AQMD	Crane	120	4
		175	11
		250	19
		500	5
	Grinder	120	1
		250	3
		500	7
		750	3
	Other	120	22
		175	6
		250	2
		500	3
Ventura County APCD	Crane	120	6
		250	2
		500	5
		750	1
	Crusher	175	1
		500	1
	Other	120	5
		175	1
		Grand Total	**289**

Source: District Survey by ARB Staff, August, 2003

Table 9

Statewide Stationary Diesel Engine Population and Emissions 2002 Base Year

Revised September 10, 2003

			Emissions (tons/day)			
Equipment Type	**Horsepower Class**	**Population**	**CO**	**NOx**	**PM**	**ROG**
Prime Generators	25 to 50	19	0.0119	0.0100	0.0016	0.0048
	51 to 120	122	0.1050	0.2599	0.0257	0.0346
	121 to 175	76	0.0973	0.2631	0.0173	0.0259
	176 to 250	74	0.1203	0.3684	0.0217	0.0330
	251 to 500	182	0.4251	1.3389	0.0725	0.1123
	501 to 750	24	0.0932	0.2926	0.0159	0.0248
	751 to 1000	41	0.2867	0.8150	0.0410	0.0731
	1001 to 1500	41	0.3998	1.1365	0.0572	0.1020
	1501 to 2000	18	0.2422	0.6885	0.0346	0.0618
	2001 to 3000	29	0.5550	1.5775	0.0794	0.1416
	3000 or more	1	0.0371	0.1054	0.0053	0.0095
Prime Generators Total		**627**	**2.3737**	**6.8560**	**0.3722**	**0.6234**
Prime Pumps	25 to 50	12	0.0086	0.0073	0.0012	0.0035
	51 to 120	80	0.0684	0.1692	0.0168	0.0225
	121 to 175	50	0.0625	0.1690	0.0111	0.0167
	176 to 250	48	0.0742	0.2272	0.0134	0.0204
	251 to 500	119	0.2835	0.8929	0.0484	0.0749
	501 to 750	16	0.0607	0.1904	0.0103	0.0161
	751 to 1000	27	0.1866	0.5304	0.0267	0.0476
	1001 to 1500	27	0.2602	0.7396	0.0372	0.0664
	1501 to 2000	12	0.1576	0.4481	0.0225	0.0402
	2001 to 3000	19	0.3612	1.0266	0.0516	0.0921
	3000 or more	1	0.0241	0.0686	0.0035	0.0062
Prime Pumps Total		**408**	**1.5476**	**4.4693**	**0.2426**	**0.4065**
Other	25 to 50	1	0.0007	0.0006	0.0001	0.0003
	51 to 120	77	0.1039	0.2577	0.0248	0.0337
	121 to 175	40	0.0595	0.1611	0.0104	0.0158
	176 to 250	41	0.0888	0.2721	0.0159	0.0243
	251 to 500	80	0.2559	0.8067	0.0433	0.0673
	501 to 750	28	0.1083	0.3414	0.0180	0.0285
	751 to 1000	5	0.0302	0.0863	0.0043	0.0076
	1001 to 1500	7	0.0603	0.1723	0.0085	0.0151
	1501 to 2000	4	0.0414	0.1183	0.0059	0.0104
	2001 to 3000	6	0.0949	0.2710	0.0134	0.0237
	3000 or more	0	0.0000	0.0000	0.0000	0.0000
Other Total		**289**	**0.8439**	**2.4876**	**0.1446**	**0.2266**
Backup Generators	25 to 50	359	0.0040	0.0054	0.0006	0.0015
	51 to 120	2324	0.0541	0.1382	0.0102	0.0160
	121 to 175	1450	0.0511	0.1445	0.0074	0.0126
	176 to 250	1398	0.0649	0.2035	0.0095	0.0165
	251 to 500	3461	0.2392	0.7755	0.0348	0.0596
	501 to 750	460	0.0523	0.1691	0.0076	0.0131
	751 to 1000	777	0.1565	0.4645	0.0223	0.0379
	1001 to 1500	778	0.2182	0.6477	0.0310	0.0528
	1501 to 2000	338	0.1322	0.3924	0.0188	0.0320
	2001 to 3000	547	0.3029	0.8990	0.0431	0.0734
	3000 or more	19	0.0202	0.0601	0.0029	0.0049
Backup Generators Total		**11909**	**1.2957**	**3.8998**	**0.1881**	**0.3202**
Backup Pumps	25 to 50	234	0.0030	0.0039	0.0004	0.0011
	51 to 120	1512	0.0352	0.0900	0.0066	0.0104
	121 to 175	943	0.0328	0.0928	0.0048	0.0081
	176 to 250	909	0.0400	0.1255	0.0059	0.0101
	251 to 500	2253	0.1595	0.5172	0.0232	0.0397
	501 to 750	299	0.0340	0.1100	0.0050	0.0086
	751 to 1000	505	0.1018	0.3023	0.0145	0.0247
	1001 to 1500	506	0.1420	0.4215	0.0202	0.0344
	1501 to 2000	220	0.0860	0.2554	0.0122	0.0208
	2001 to 3000	356	0.1971	0.5850	0.0280	0.0477
	3000 or more	12	0.0132	0.0391	0.0019	0.0032
Backup Pumps Total		**7750**	**0.8447**	**2.5426**	**0.1227**	**0.2088**
Statewide Total		**20983**	**6.9056**	**20.2553**	**1.0702**	**1.7856**

Table 10

Stationary Diesel Engine Population by District, 2002

Revised August 14, 2003

District	Air Compressors	Prime Generators	Backup Generators	Prime Pumps	Backup Pumps	Other	Total
Amador County APCD	0	1	12	0	8	0	**21**
Antelope Valley APCD	0	6	105	4	68	0	**182**
Bay Area AQMD	0	120	2285	78	1487	114	**4084**
Butte County AQMD	0	4	70	2	46	0	**122**
Calaveras County AQMD	0	1	14	0	9	0	**25**
Colusa County APCD	0	0	7	0	4	0	**11**
El Dorado County APCD	0	3	56	2	36	0	**97**
Feather River AQMD	0	3	49	2	32	0	**85**
Glenn County APCD	0	0	9	0	6	0	**16**
Great Basin Unified APCD	0	1	11	0	7	0	**19**
Imperial County APCD	0	3	51	2	33	0	**89**
Kern County APCD	0	2	40	1	26	0	**69**
Lake County AQMD	0	1	21	1	13	0	**36**
Lassen County APCD	0	1	12	0	7	0	**20**
Mariposa County APCD	0	0	6	0	4	0	**10**
Mendocino County AQMD	0	2	30	1	19	0	**52**
Modoc County APCD	0	0	3	0	2	0	**5**
Mojave Desert AQMD	0	7	142	5	92	0	**246**
Monterey Bay Unified APCD	1	13	245	8	160	0	**427**
North Coast Unified APCD	0	3	57	2	37	0	**99**
Northern Sierra AQMD	0	2	41	1	26	5	**75**
Northern Sonoma County APCD	0	1	20	1	13	0	**34**
Placer County APCD	0	5	91	3	59	1	**160**
Sacramento Metropolitan AQMD	0	23	438	15	285	2	**763**
San Diego County APCD	1	52	990	34	644	15	**1737**
San Joaquin Valley Unified APCD	3	60	1136	39	739	39	**2016**
San Luis Obispo County APCD	0	5	86	3	56	0	**149**
Santa Barbara County APCD	0	7	138	5	90	0	**239**
Shasta County AQMD	0	3	58	2	38	0	**100**
Siskiyou County APCD	0	1	15	1	10	0	**26**
South Coast AQMD	0	277	5268	180	3428	86	**9239**
Tehama County APCD	0	1	19	1	13	0	**34**
Tuolumne County APCD	0	1	19	1	12	0	**33**
Ventura County APCD	0	14	265	9	172	22	**483**
Yolo/Solano AQMD	0	5	103	4	67	0	**178**
Total	**5**	**627**	**11909**	**408**	**7750**	**284**	**20983**

Table 11

Stationary Diesel Engines Emissions by District, 2002

Revised September 9, 2003

District	Emissions (tons/day)			
	CO	NO_x	PM	ROG
Amador County APCD	0.0062	0.0183	0.0010	0.0016
Antelope Valley APCD	0.0534	0.1565	0.0082	0.0137
Bay Area AQMD	1.5569	4.5707	0.2385	0.4004
Butte County AQMD	0.0359	0.1051	0.0055	0.0092
Calaveras County AQMD	0.0073	0.0213	0.0011	0.0019
Colusa County APCD	0.0034	0.0098	0.0005	0.0009
El Dorado County APCD	0.0284	0.0831	0.0043	0.0073
Feather River AQMD	0.0249	0.0729	0.0038	0.0064
Glenn County APCD	0.0046	0.0135	0.0007	0.0012
Great Basin Unified APCD	0.0056	0.0165	0.0009	0.0014
Imperial County APCD	0.0261	0.0765	0.0040	0.0067
Kern County APCD	0.0203	0.0595	0.0031	0.0052
Lake County AQMD	0.0105	0.0308	0.0016	0.0027
Lassen County APCD	0.0059	0.0172	0.0009	0.0015
Mariposa County APCD	0.0030	0.0088	0.0005	0.0008
Mendocino County AQMD	0.0151	0.0442	0.0023	0.0039
Modoc County APCD	0.0016	0.0047	0.0002	0.0004
Mojave Desert AQMD	0.0722	0.2116	0.0110	0.0186
Monterey Bay Unified APCD	0.1275	0.3744	0.0195	0.0328
North Coast Unified APCD	0.0289	0.0848	0.0044	0.0074
Northern Sierra AQMD	0.0299	0.0863	0.0049	0.0080
Northern Sonoma County APCD	0.0100	0.0293	0.0015	0.0026
Placer County APCD	0.0466	0.1365	0.0071	0.0120
Sacramento Metropolitan AQMD	0.2276	0.6676	0.0349	0.0586
San Diego County APCD	0.5371	1.5774	0.0830	0.1388
San Joaquin Valley Unified APCD	0.7176	2.1107	0.1134	0.1868
San Luis Obispo County APCD	0.0437	0.1281	0.0067	0.0112
Santa Barbara County APCD	0.0700	0.2053	0.0107	0.0180
Shasta County AQMD	0.0294	0.0861	0.0045	0.0076
Siskiyou County APCD	0.0076	0.0223	0.0012	0.0020
South Coast AQMD	2.8953	8.4854	0.4495	0.7494
Tehama County APCD	0.0098	0.0288	0.0015	0.0025
Tuolumne County APCD	0.0097	0.0283	0.0015	0.0025
Ventura County APCD	0.1815	0.5298	0.0298	0.0481
Yolo/Solano AQMD	0.0523	0.1532	0.0080	0.0134
Total	**6.9056**	**20.2553**	**1.0702**	**1.7856**

Table 12

Forecasted Stationary Diesel Emissions

Pollutant	Equipment	2005	2010	2015	2020
CO	Prime Generators	2.049	1.455	1.056	0.792
	Prime Pumps	1.336	0.949	0.688	0.517
	Other	0.298	0.227	0.179	0.154
	Backup Generators	1.198	1.018	0.904	0.847
	Backup Pumps	0.781	0.664	0.589	0.552
CO Total		**5.661**	**4.313**	**3.415**	**2.862**
NOx	Prime Generators	6.243	4.709	3.579	2.694
	Prime Pumps	4.069	3.069	2.332	1.755
	Other	0.936	0.746	0.584	0.473
	Backup Generators	3.805	3.390	2.991	2.767
	Backup Pumps	2.481	2.210	1.950	1.804
NOx Total		**17.534**	**14.125**	**11.435**	**9.493**
PM	Prime Generators	0.320	0.224	0.156	0.095
	Prime Pumps	0.209	0.146	0.102	0.062
	Other	0.050	0.037	0.027	0.018
	Backup Generators	0.175	0.144	0.118	0.091
	Backup Pumps	0.114	0.094	0.077	0.059
PM Total		**0.868**	**0.645**	**0.479**	**0.325**
ROG	Prime Generators	0.555	0.396	0.282	0.202
	Prime Pumps	0.362	0.258	0.184	0.132
	Other	0.081	0.060	0.044	0.035
	Backup Generators	0.300	0.238	0.187	0.152
	Backup Pumps	0.195	0.155	0.122	0.099
ROG Total		**1.493**	**1.108**	**0.820**	**0.621**

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11. Stationary Diesel Engines in the Northeast: An Initial Assessment of the Regional Population, Control Technology Options and Air Quality Policy Issues, Northeast States for Coordinated Air Use Management, June 2003.
12. City/County Population Estimates with Annual Percent Change — January 1, 2002 and 2003, California Department of Finance.

PREPARED BY

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September 2003

Attachment A
California Population Distribution

District	Air Basin	District	Air Basin	County	Population - 2002	Percent of Statewide Population
Amador County APCD	Mountain Counties	Amador County APCD	Mountain Counties	Amador	36,350	0.1%
Antelope Valley APCD	Mojave Desert	Antelope Valley APCD	Mojave Desert	Los Angeles	310,900	0.9%
Bay Area AQMD	San Francisco Bay Area	Bay Area AQMD	San Francisco Bay Area	Alameda	1,490,000	4.2%
		Bay Area AQMD	San Francisco Bay Area	Contra Costa	987,000	2.8%
		Bay Area AQMD	San Francisco Bay Area	Marin	249,100	0.7%
		Bay Area AQMD	San Francisco Bay Area	Napa	128,900	0.4%
		Bay Area AQMD	San Francisco Bay Area	San Francisco	789,800	2.2%
		Bay Area AQMD	San Francisco Bay Area	San Mateo	713,800	2.0%
		Bay Area AQMD	San Francisco Bay Area	Santa Clara	1,718,500	4.9%
		Bay Area AQMD	San Francisco Bay Area	Solano	283,300	0.8%
		Bay Area AQMD	San Francisco Bay Area	Sonoma	412,000	1.2%
Butte County AQMD	Sacramento Valley	Butte County AQMD	Sacramento Valley	Butte	208,800	0.6%
Calaveras County AQMD	Mountain Counties	Calaveras County AQMD	Mountain Counties	Calaveras	42,250	0.1%
Colusa County APCD	Sacramento Valley	Colusa County APCD	Sacramento Valley	Colusa	19,550	0.1%
El Dorado County APCD	Lake Tahoe	El Dorado County APCD	Lake Tahoe	El Dorado	36,000	0.1%
	Mountain Counties	El Dorado County APCD	Mountain Counties	El Dorado	129,200	0.4%
Feather River AQMD	Sacramento Valley	Feather River AQMD	Sacramento Valley	Sutter	82,500	0.2%
		Feather River AQMD	Sacramento Valley	Yuba	62,400	0.2%
Glenn County APCD		Glenn County APCD	Sacramento Valley	Glenn	26,850	0.1%
Great Basin Unified APCD	Great Basin Valleys	Great Basin Unified APCD	Great Basin Valleys	Alpine	1,230	0.0%
		Great Basin Unified APCD	Great Basin Valleys	Inyo	18,250	0.1%
		Great Basin Unified APCD	Great Basin Valleys	Mono	13,350	0.0%
Imperial County APCD	Salton Sea	Imperial County APCD	Salton Sea	Imperial	151,900	0.4%
Kern County APCD	Mojave Desert	Kern County APCD	Mojave Desert	Kern	118,200	0.3%
Lake County AQMD	Lake County	Lake County AQMD	Lake County	Lake	61,100	0.2%
Lassen County APCD	Northeast Plateau	Lassen County APCD	Northeast Plateau	Lassen	34,150	0.1%
Mariposa County APCD	Mountain Counties	Mariposa County APCD	Mountain Counties	Mariposa	17,400	0.0%

Attachment A
California Population Distribution

District	Air Basin	District	Air Basin	County	Population - 2002	Percent Statewide Population
Mendocino County AQMD	North Coast	Mendocino County AQMD	North Coast	Mendocino	87,900	0.2%
Modoc County APCD	Northeast Plateau	Modoc County APCD	Northeast Plateau	Modoc	9,300	0.0%
Mojave Desert AQMD	Mojave Desert	Mojave Desert AQMD	Mojave Desert	Riverside	17,800	0.1%
		Mojave Desert AQMD	Mojave Desert	San Bernardino	402,700	1.1%
Monterey Bay Unified APCD	North Central Coast	Monterey Bay Unified APCD	North Central Coast	Monterey	412,000	1.2%
		Monterey Bay Unified APCD	North Central Coast	San Benito	56,000	0.2%
		Monterey Bay Unified APCD	North Central Coast	Santa Cruz	259,000	0.7%
North Coast Unified APCD	North Coast	North Coast Unified APCD	North Coast	Del Norte	27,850	0.1%
		North Coast Unified APCD	North Coast	Humboldt	127,500	0.4%
		North Coast Unified APCD	North Coast	Trinity	13,100	0.0%
Northern Sierra AQMD	Mountain Counties	Northern Sierra AQMD	Mountain Counties	Nevada	95,700	0.3%
		Northern Sierra AQMD	Mountain Counties	Plumas	20,950	0.1%
		Northern Sierra AQMD	Mountain Counties	Sierra	3,520	0.0%
Northern Sonoma County APCD	North Coast	Northern Sonoma County APCD	North Coast	Sonoma	58,200	0.2%
Placer County APCD	Lake Tahoe	Placer County APCD	Lake Tahoe	Placer	13,200	0.0%
	Mountain Counties	Placer County APCD	Mountain Counties	Placer	24,100	0.1%
	Sacramento Valley	Placer County APCD	Sacramento Valley	Placer	233,400	0.7%
Sacramento Metropolitan AQMD		Sacramento Metropolitan AQMD	Sacramento Valley	Sacramento	1,297,600	3.7%
San Diego County APCD	San Diego	San Diego County APCD	San Diego	San Diego	2,935,100	8.3%
San Joaquin Valley Unified APCD	San Joaquin Valley	San Joaquin Valley Unified APCD	San Joaquin Valley	Fresno	835,400	2.4%
		San Joaquin Valley Unified APCD	San Joaquin Valley	Kern	578,900	1.6%
		San Joaquin Valley Unified APCD	San Joaquin Valley	Kings	134,700	0.4%
		San Joaquin Valley Unified APCD	San Joaquin Valley	Madera	131,800	0.4%
		San Joaquin Valley Unified APCD	San Joaquin Valley	Merced	222,700	0.6%
		San Joaquin Valley Unified APCD	San Joaquin Valley	San Joaquin	605,500	1.7%
		San Joaquin Valley Unified APCD	San Joaquin Valley	Stanislaus	477,100	1.4%

Attachment A
California Population Distribution

District	Air Basin	District	Air Basin	County	Population - 2002	Percent of Statewide Population
		San Joaquin Valley Unified APCD	San Joaquin Valley	Tulare	382,000	1.1%
San Luis Obispo County APCD	South Central Coast	San Luis Obispo County APCD	South Central Coast	San Luis Obispo	254,500	0.7%
Santa Barbara County APCD		Santa Barbara County APCD	South Central Coast	Santa Barbara	407,800	1.2%
Shasta County AQMD	Sacramento Valley	Shasta County AQMD	Sacramento Valley	Shasta	171,100	0.5%
Siskiyou County APCD	Northeast Plateau	Siskiyou County APCD	Northeast Plateau	Siskiyou	44,300	0.1%
South Coast AQMD	Mojave Desert	South Coast AQMD	Mojave Desert	Riverside	10,100	0.0%
	Salton Sea	South Coast AQMD	Salton Sea	Riverside	351,000	1.0%
	South Coast	South Coast AQMD	South Coast	Los Angeles	9,591,800	27.2%
		South Coast AQMD	South Coast	Orange	2,954,500	8.4%
		South Coast AQMD	South Coast	Riverside	1,298,100	3.7%
		South Coast AQMD	South Coast	San Bernardino	1,409,000	4.0%
Tehama County APCD	Sacramento Valley	Tehama County APCD	Sacramento Valley	Tehama	57,300	0.2%
Tuolumne County APCD	Mountain Counties	Tuolumne County APCD	Mountain Counties	Tuolumne	56,200	0.2%
Ventura County APCD	South Central Coast	Ventura County APCD	South Central Coast	Ventura	785,700	2.2%
Yolo/Solano AQMD	Sacramento Valley	Yolo/Solano AQMD	Sacramento Valley	Solano	125,400	0.4%
		Yolo/Solano AQMD	Sacramento Valley	Yolo	179,000	0.5%
Statewide Total					**35,301,600**	**100%**

Source: California Department of Finance, 2002 (see reference 12)

Attachment B

Age Distribution of Stationary Diesel Commercial Engines

Year	Age	% Prime	% Backup
2002	0	3.55	2.99
2001	1	7.01	5.91
2000	2	7.36	6.20
1999	3	7.72	6.50
1998	4	7.63	6.43
1997	5	7.54	6.36
1996	6	7.42	6.25
1995	7	6.69	5.63
1994	8	5.16	4.35
1993	9	3.59	3.03
1992	10	2.88	2.43
1991	11	2.89	2.44
1990	12	3.84	3.24
1989	13	4.71	3.97
1988	14	4.47	3.77
1987	15	4.12	3.47
1986	16	2.94	2.48
1985	17	1.76	1.49
1984	18	1.41	1.19
1983	19	1.18	0.99
1982	20	1.06	0.89
1981	21	1.00	0.88
1980	22	0.94	0.86
1979	23	0.71	0.85
1978	24	0.59	0.83
1977	25	0.53	0.82
1976	26	0.41	0.81
1975	27	0.29	0.79
1974	28	0.24	0.78
1973	29	0.16	0.76
1972	30	0.10	0.75
1971	31	0.06	0.73
1970	32	0.03	0.72
1969	33		0.70
1968	34		0.69
1967	35		0.67
1966	36		0.66
1965	37		0.65
1964	38		0.63
1963	39		0.62
1962	40		0.60
1961	41		0.59
1960	42		0.57
1959	43		0.56

Attachment B

Age Distribution of Stationary Diesel Commercial Engines

Year	Age	% Prime	% Backup
1958	44		0.54
1957	45		0.53
1956	46		0.51
1955	47		0.50
1954	48		0.49
1953	49		0.47
1952	50		0.46

Source: OFFROAD Model Documentation(Prime) and District Permit Data (Backup)

Attachment C Stationary Diesel Engine Operating Assumptions Revised August 14, 2003				
Equipment	**Horsepower**	**Average Horsepower**	**Activity(hrs/year)**	**Load Factor**
		HP_{et}	$Activity_{et.hp}$	$Lf_{et.hp}$
Air Compressors	25-50	37	815	0.48
	51-120	78	815	0.48
	121-175	147	815	0.48
	176-250	218	815	0.48
	251-500	385	815	0.48
	501-750	595	815	0.48
	750-1000	889	815	0.48
	1000-1500	1238	815	0.48
	1500-2000	1726	815	0.48
	2000-3000	2444	815	0.48
	>3000	4726	815	0.48
Prime Generators	25-50	33	953	0.74
	51-120	84	953	0.74
	121-175	153	953	0.74
	176-250	229	953	0.74
	251-500	363	953	0.74
	501-750	586	953	0.74
	750-1000	889	953	0.74
	1000-1500	1238	953	0.74
	1500-2000	1726	953	0.74
	2000-3000	2444	953	0.74
	>3000	4726	953	0.74
Backup Generators	25-50	33	30	0.74
	51-120	84	30	0.74
	121-175	153	30	0.74
	176-250	229	30	0.74
	251-500	363	30	0.74
	501-750	586	30	0.74
	750-1000	889	30	0.74
	1000-1500	1238	30	0.74
	1500-2000	1726	30	0.74
	2000-3000	2444	30	0.74
	>3000	4726	30	0.74
Prime Pumps	25-50	37	953	0.74
	51-120	84	953	0.74
	121-175	151	953	0.74
	176-250	217	953	0.74
	251-500	372	953	0.74
	501-750	586	953	0.74
	750-1000	889	953	0.74
	1000-1500	1238	953	0.74
	1500-2000	1726	953	0.74
	2000-3000	2444	953	0.74
	>3000	4726	953	0.74
Backup Pumps	25-50	37	30	0.74
	51-120	84	30	0.74
	121-175	151	30	0.74

Attachment C
Stationary Diesel Engine Operating Assumptions

Revised August 14, 2003

Equipment	Horsepower	Average Horsepower	Activity(hrs/year)	Load Factor
		HP_{et}	$Activity_{et,hp}$	$Lf_{et,hp}$
	176-250	217	30	0.74
	251-500	372	30	0.74
	501-750	586	30	0.74
	750-1000	889	30	0.74
	1000-1500	1238	30	0.74
	1500-2000	1726	30	0.74
	2000-3000	2444	30	0.74
	>3000	4726	30	0.74
Other	25-50	42	394	0.375
	51-120	67	394	0.375
	121-175	162.5	394	0.375
	176-250	218	394	0.375
	251-500	385	394	0.375
	501-750	595	394	0.375
	750-1000	889	394	0.375
	1000-1500	1238	394	0.375
	1500-2000	1726	394	0.375
	2000-3000	2444	394	0.375
	>3000	4726	394	0.375
Crane	50	42	1024	0.32
	120	109	1024	0.32
	175	150	1024	0.32
	250	202	1024	0.32
	500	354	1024	0.32
	750	545	1024	0.32
	1000	889	1024	0.32
	1500	1238	1024	0.32
	2000	1726	1024	0.32
	3000	2444	1024	0.32
	10000	4726	1024	0.32
Crusher	50	42	1226	0.44
	120	105	1226	0.44
	175	148	1226	0.44
	250	180	1226	0.44
	500	390	1226	0.44
	750	695	1226	0.44
	1000	889	1226	0.44
	1500	1238	1226	0.44
	2000	1726	1226	0.44
	3000	2444	1226	0.44
	10000	4726	1226	0.44
Grinder	50	42	798	0.4
	120	82	798	0.4
	175	163	798	0.4
	250	230	798	0.4
	500	393	798	0.4
	750	582	798	0.4
	1000	800	798	0.4

Attachment C
Stationary Diesel Engine Operating Assumptions

Revised August 14, 2003

Equipment	Horsepower	Average Horsepower	Activity(hrs/year)	Load Factor
		HP_{et}	$Activity_{et.hp}$	$Lf_{et.hp}$
	1500	1238	798	0.4
	2000	1726	798	0.4
	3000	2444	798	0.4
	10000	4726	798	0.4
Other	50	46	735	0.42
	120	93	735	0.42
	175	146	735	0.42
	250	221	735	0.42
	500	374	735	0.42
	750	659	735	0.42
	1000	950	735	0.42
	1500	1288	735	0.42
	2000	1547	735	0.42
	3000	2363	735	0.42
	10000	4726	735	0.42
Turbine_Starter	50	42	23	0.8
	120	67	23	0.8
	175	163	23	0.8
	250	218	23	0.8
	500	313	23	0.8
	750	595	23	0.8
	1000	889	23	0.8
	1500	1238	23	0.8
	2000	1726	23	0.8
	3000	2444	23	0.8
	10000	4726	23	0.8

Source: Power Systems Research (PSR) 1996 Database and District Permit Survey Data

Attachment D
Emission Factors Used in OFFROAD Model

Key: ZH = Zero Hour($ZH_{et,hp,my,pol}$); det = Deterioration Rate($DR_{et,hp,my,pol}$)

HP	Year	ROG ZH	ROG det	CO ZH	CO det	NOx ZH	NOx det	PM ZH	PM det
		(g/hp-hr)	(g/hp-hr2)	(g/hp-hr)	(g/hp-hr2)	(g/hp-hr)	(g/hp-hr2)	(g/hp-hr)	(g/hp-hr2)
25-50	1970-1987	1.84	2.35E-04	5.00	5.13E-04	6.90	1.04E-04	0.76	5.89E-05
25-50	1988-1998	1.80	2.30E-04	5.00	5.13E-04	6.90	1.04E-04	0.76	5.89E-05
25-50	1999-2003	1.45	1.85E-04	4.10	4.20E-04	5.55	1.03E-04	0.60	4.65E-05
25-50	2004	0.64	9.80E-05	3.27	3.34E-04	5.10	9.33E-05	0.43	3.36E-05
25-50	2005	0.37	6.90E-05	3.00	3.05E-04	4.95	9.67E-05	0.38	2.93E-05
25-50	2006-2007	0.24	5.45E-05	2.86	2.90E-04	4.88	9.83E-05	0.35	2.72E-05
25-50	2008-2020	0.10	4.00E-05	2.72	2.76E-04	4.80	1.00E-04	0.32	2.50E-05
51-120	1970-1987	1.44	6.66E-05	4.80	1.27E-04	13.00	3.01E-04	0.84	6.11E-05
51-120	1988-1997	0.99	4.58E-05	3.49	9.23E-05	8.75	2.02E-04	0.69	5.02E-05
51-120	1998-2003	0.99	4.58E-05	3.49	9.23E-05	6.90	1.60E-04	0.69	5.02E-05
51-120	2004	0.46	3.33E-05	3.23	8.55E-05	5.64	1.03E-04	0.39	2.85E-05
51-120	2005	0.28	2.92E-05	3.14	8.33E-05	5.22	8.40E-05	0.29	2.12E-05
51-120	2006-2007	0.19	2.71E-05	3.09	8.21E-05	5.01	7.45E-05	0.28	1.76E-05
51-120	2008-2020	0.10	2.50E-05	3.05	8.10E-05	2.89	3.80E-05	0.28	1.40E-05
121-175	1969	1.32	6.11E-05	4.40	1.16E-04	14.00	3.24E-04	0.77	5.60E-05
121-175	1970-1971	1.10	5.09E-05	4.40	1.16E-04	13.00	3.01E-04	0.66	4.80E-05
121-175	1972-1979	1.00	4.63E-05	4.40	1.16E-04	12.00	2.78E-04	0.55	4.00E-05
121-175	1980-1984	0.94	4.35E-05	4.30	1.14E-04	11.00	2.54E-04	0.55	4.00E-05
121-175	1985-1987	0.88	4.07E-05	4.20	1.11E-04	11.00	2.54E-04	0.55	4.00E-05
121-175	1988-1996	0.68	3.15E-05	2.70	7.14E-05	8.17	1.89E-04	0.38	2.76E-05
121-175	1997-2002	0.68	3.15E-05	2.70	7.14E-05	6.90	1.60E-04	0.38	2.76E-05
121-175	2003	0.33	2.79E-05	2.70	7.14E-05	5.26	9.64E-05	0.28	1.70E-05
121-175	2004	0.22	2.63E-05	2.70	7.14E-05	4.72	7.52E-05	0.28	1.35E-05
121-175	2005-2006	0.16	2.57E-05	2.70	7.14E-05	4.44	6.46E-05	0.28	1.18E-05
121-175	2007-2020	0.10	2.50E-05	2.70	7.14E-05	2.45	2.45E-05	0.28	1.00E-05
176-250	1969	1.32	6.11E-05	4.40	1.16E-04	14.00	3.24E-04	0.77	5.60E-05
176-250	1970-1971	1.10	5.09E-05	4.40	1.16E-04	13.00	3.01E-04	0.66	4.80E-05
176-250	1972-1979	1.00	4.63E-05	4.40	1.16E-04	12.00	2.78E-04	0.55	4.00E-05
176-250	1980-1984	0.94	4.35E-05	4.30	1.14E-04	11.00	2.54E-04	0.55	4.00E-05
176-250	1985-1987	0.88	4.07E-05	4.20	1.11E-04	11.00	2.54E-04	0.55	4.00E-05
176-250	1988-1995	0.68	3.15E-05	2.70	7.14E-05	8.17	1.89E-04	0.38	2.76E-05
176-250	1996-2002	0.32	1.48E-05	0.92	2.43E-05	6.25	1.45E-04	0.28	7.96E-06
176-250	2003	0.19	2.09E-05	0.92	2.43E-05	5.00	9.05E-05	0.28	6.51E-06
176-250	2004	0.14	2.30E-05	0.92	2.43E-05	4.58	7.23E-05	0.28	6.03E-06
176-250	2005-2006	0.12	2.40E-05	0.92	2.43E-05	4.38	6.33E-05	0.28	5.79E-06
176-250	2007-2020	0.10	2.50E-05	0.92	2.43E-05	2.45	3.18E-05	0.28	5.59E-06
251-500	1969	1.26	4.39E-05	4.20	8.32E-05	14.00	2.33E-04	0.74	3.93E-05
251-500	1970-1971	1.05	3.66E-05	4.20	8.32E-05	13.00	2.16E-04	0.63	3.34E-05
251-500	1972-1979	0.95	3.31E-05	4.20	8.32E-05	12.00	2.00E-04	0.53	2.81E-05
251-500	1980-1984	0.90	3.14E-05	4.20	8.32E-05	11.00	1.83E-04	0.53	2.81E-05
251-500	1985-1987	0.84	2.93E-05	4.10	8.12E-05	11.00	1.83E-04	0.53	2.81E-05
251-500	1988-1995	0.68	2.37E-05	2.70	5.35E-05	8.17	1.36E-04	0.38	2.02E-05
251-500	1996-2000	0.32	1.12E-05	0.92	1.82E-05	6.25	1.04E-04	0.28	7.96E-06
251-500	2001	0.19	1.95E-05	0.92	1.82E-05	4.95	7.34E-05	0.28	6.51E-06
251-500	2002	0.14	2.22E-05	0.92	1.82E-05	4.51	6.32E-05	0.28	6.03E-06
251-500	2003-2004	0.12	2.36E-05	0.92	1.82E-05	4.29	5.81E-05	0.28	5.79E-06
251-500	2005	0.10	2.50E-05	0.92	1.82E-05	4.00	5.30E-05	0.28	5.55E-06

Attachment D
Emission Factors Used in OFFROAD Model

Key: ZH = Zero Hour($ZH_{et,hp,my,pol}$); det = Deterioration Rate($DR_{et,hp,my,pol}$)

HP	Year	ROG ZH	ROG det	CO ZH	CO det	NOx ZH	NOx det	PM ZH	PM det
		(g/hp-hr)	(g/hp-hr2)	(g/hp-hr)	(g/hp-hr2)	(g/hp-hr)	(g/hp-hr2)	(g/hp-hr)	(g/hp-hr2)
251-500	2006-2020	0.10	2.50E-05	0.92	1.82E-05	2.45	3.18E-05	0.28	5.55E-06
501-750	1969	1.26	4.39E-05	4.20	8.32E-05	14.00	2.33E-04	0.74	3.93E-05
501-750	1970-1971	1.05	3.66E-05	4.20	8.32E-05	13.00	2.16E-04	0.63	3.34E-05
501-750	1972-1979	0.95	3.31E-05	4.20	8.32E-05	12.00	2.00E-04	0.53	2.81E-05
501-750	1980-1984	0.90	3.14E-05	4.20	8.32E-05	11.00	1.83E-04	0.53	2.81E-05
501-750	1985-1987	0.84	2.93E-05	4.10	8.12E-05	11.00	1.83E-04	0.53	2.81E-05
501-750	1988-1995	0.68	2.37E-05	2.70	5.35E-05	8.17	1.36E-04	0.38	2.02E-05
501-750	1996-2001	0.32	1.12E-05	0.92	1.82E-05	6.25	1.04E-04	0.28	7.96E-06
501-750	2002	0.19	1.95E-05	0.92	1.82E-05	4.95	7.34E-05	0.28	6.51E-06
501-750	2003	0.14	2.22E-05	0.92	1.82E-05	4.51	6.32E-05	0.28	6.03E-06
501-750	2004-2005	0.12	2.36E-05	0.92	1.82E-05	4.29	5.81E-05	0.28	5.79E-06
501-750	2006-2020	0.10	2.50E-05	0.92	1.82E-05	2.45	3.18E-05	0.28	5.55E-06
>751	1969	1.26	4.39E-05	4.20	8.32E-05	14.00	2.33E-04	0.74	3.93E-05
>751	1970-1971	1.05	3.66E-05	4.20	8.32E-05	13.00	2.16E-04	0.63	3.34E-05
>751	1972-1979	0.95	3.31E-05	4.20	8.32E-05	12.00	2.00E-04	0.53	2.81E-05
>751	1980-1984	0.90	3.14E-05	4.20	8.32E-05	11.00	1.83E-04	0.53	2.81E-05
>751	1985-1987	0.84	2.93E-05	4.10	8.12E-05	11.00	1.83E-04	0.53	2.81E-05
>751	1988-1999	0.68	2.37E-05	2.70	5.35E-05	8.17	1.36E-04	0.38	2.02E-06
>751	2000-2005	0.32	1.12E-05	0.92	1.82E-05	6.25	1.04E-04	0.28	7.96E-06
>751	2006	0.19	1.95E-05	0.92	1.82E-05	4.95	7.34E-05	0.28	6.51E-06
>751	2007	0.14	2.22E-05	0.92	1.82E-05	4.51	6.32E-05	0.28	6.03E-06
>751	2008-2009	0.12	2.36E-05	0.92	1.82E-05	4.29	5.81E-05	0.28	5.79E-06
>751	2010-2020	0.10	2.50E-05	0.92	1.82E-05	4.08	5.30E-05	0.28	5.55E-06

Source: ARB OFFROAD Model

Note: ZH means Zero-Hour, det means deterioration rate

1.84	0.00	5.00	0.00	14.00	0.00	0.84	0.00
0.10	0.00	0.92	0.00	2.45	0.00	0.28	0.00

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
Amador County APCD	Mountain Counties	Amador	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0003	0.0000	0.0000
				175	0.1	0.0001	0.0003	0.0000	0.0000
				250	0.1	0.0001	0.0004	0.0000	0.0000
				500	0.2	0.0004	0.0014	0.0001	0.0001
				750	0.0	0.0001	0.0003	0.0000	0.0000
				1000	0.0	0.0003	0.0008	0.0000	0.0001
				1500	0.0	0.0004	0.0012	0.0001	0.0001
				2000	0.0	0.0002	0.0007	0.0000	0.0001
				3000	0.0	0.0006	0.0016	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0002	0.0000	0.0000
				175	0.1	0.0001	0.0002	0.0000	0.0000
				250	0.0	0.0001	0.0002	0.0000	0.0000
				500	0.1	0.0003	0.0009	0.0000	0.0001
				750	0.0	0.0001	0.0002	0.0000	0.0000
				1000	0.0	0.0002	0.0005	0.0000	0.0000
				1500	0.0	0.0003	0.0008	0.0000	0.0001
				2000	0.0	0.0002	0.0005	0.0000	0.0000
				3000	0.0	0.0004	0.0011	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.4	0.0000	0.0000	0.0000	0.0000
				120	2.4	0.0001	0.0001	0.0000	0.0000
				175	1.5	0.0001	0.0001	0.0000	0.0000
				250	1.4	0.0001	0.0002	0.0000	0.0000
				500	3.6	0.0002	0.0008	0.0000	0.0001
				750	0.5	0.0001	0.0002	0.0000	0.0000
				1000	0.8	0.0002	0.0005	0.0000	0.0000
				1500	0.8	0.0002	0.0007	0.0000	0.0001
				2000	0.3	0.0001	0.0004	0.0000	0.0000
				3000	0.6	0.0003	0.0009	0.0000	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Backup Pumps	50	0.2	0.0000	0.0000	0.0000	0.0000
				120	1.6	0.0000	0.0001	0.0000	0.0000
				175	1.0	0.0000	0.0001	0.0000	0.0000
				250	0.9	0.0000	0.0001	0.0000	0.0000
				500	2.3	0.0002	0.0005	0.0000	0.0000
				750	0.3	0.0000	0.0001	0.0000	0.0000
				1000	0.5	0.0001	0.0003	0.0000	0.0000
				1500	0.5	0.0001	0.0004	0.0000	0.0000
				2000	0.2	0.0001	0.0003	0.0000	0.0000
				3000	0.4	0.0002	0.0006	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
Amador County APCD Total		0	0	0	21.3	0.0062	0.0183	0.0010	0.0016
Antelope Valley APCD	Mojave Desert	Los Angeles	Prime Generators	50	0.2	0.0001	0.0001	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				120	1.1	0.0009	0.0023	0.0002	0.0003
				175	0.7	0.0009	0.0023	0.0002	0.0002
				250	0.6	0.0011	0.0032	0.0002	0.0003
				500	1.6	0.0037	0.0118	0.0006	0.0010
				750	0.2	0.0008	0.0026	0.0001	0.0002
				1000	0.4	0.0025	0.0072	0.0004	0.0006
				1500	0.4	0.0035	0.0100	0.0005	0.0009
				2000	0.2	0.0021	0.0061	0.0003	0.0005
				3000	0.3	0.0049	0.0139	0.0007	0.0012
				10000	0.0	0.0003	0.0009	0.0000	0.0001
			Prime Pumps	50	0.1	0.0001	0.0001	0.0000	0.0000
				120	0.7	0.0006	0.0015	0.0001	0.0002
				175	0.4	0.0006	0.0015	0.0001	0.0001
				250	0.4	0.0007	0.0020	0.0001	0.0002
				500	1.0	0.0025	0.0079	0.0004	0.0007
				750	0.1	0.0005	0.0017	0.0001	0.0001
				1000	0.2	0.0016	0.0047	0.0002	0.0004
				1500	0.2	0.0023	0.0065	0.0003	0.0006
				2000	0.1	0.0014	0.0039	0.0002	0.0004
				3000	0.2	0.0032	0.0090	0.0005	0.0008
				10000	0.0	0.0002	0.0006	0.0000	0.0001
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0[illegible]
				1000	0.0	0.0000	0.0000	0.0000	0.[illegible]
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	3.2	0.0000	0.0000	0.0000	0.0000
				120	20.5	0.0005	0.0012	0.0001	0.0001
				175	12.8	0.0005	0.0013	0.0001	0.0001
				250	12.3	0.0006	0.0018	0.0001	0.0001
				500	30.5	0.0021	0.0068	0.0003	0.0005
				750	4.1	0.0005	0.0015	0.0001	0.0001
				1000	6.8	0.0014	0.0041	0.0002	0.0003
				1500	6.8	0.0019	0.0057	0.0003	0.0005
				2000	3.0	0.0012	0.0035	0.0002	0.0003
				3000	4.8	0.0027	0.0079	0.0004	0.0006
				10000	0.2	0.0002	0.0005	0.0000	0.0000
			Backup Pumps	50	2.1	0.0000	0.0000	0.0000	0.0000
				120	13.3	0.0003	0.0008	0.0001	0.0001
				175	8.3	0.0003	0.0008	0.0000	0.0001
				250	8.0	0.0004	0.0011	0.0001	0.0001
				500	19.8	0.0014	0.0046	0.0002	0.0003
				750	2.6	0.0003	0.0010	0.0000	0.0001
				1000	4.5	0.0009	0.0027	0.0001	0.0002
				1500	4.5	0.0013	0.0037	0.0002	0.0003
				2000	1.9	0.0008	0.0022	0.0001	0.0002
				3000	3.1	0.0017	0.0052	0.0002	0.0004
				10000	0.1	0.0001	0.0003	0.0000	0.0000
Antelope Valley APCD Total		0	0	0	182.3	0.0534	0.1565	0.0082	0.0137
Bay Area AQMD	San Francisco Bay Area	Alameda	Prime Generators	50	0.8	0.0005	0.0004	0.0001	0.0002
				120	5.2	0.0044	0.0110	0.0011	0.[illegible]
				175	3.2	0.0041	0.0111	0.0007	0.0011
				250	3.1	0.0051	0.0156	0.0009	0.0014

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				500	7.7	0.0179	0.0565	0.0031	0.0047
				750	1.0	0.0039	0.0124	0.0007	0.0010
				1000	1.7	0.0121	0.0344	0.0017	0.0031
				1500	1.7	0.0169	0.0480	0.0024	0.0043
				2000	0.8	0.0102	0.0291	0.0015	0.0026
				3000	1.2	0.0234	0.0666	0.0033	0.0060
				10000	0.0	0.0016	0.0044	0.0002	0.0004
			Prime Pumps	50	0.5	0.0004	0.0003	0.0000	0.0001
				120	3.4	0.0029	0.0071	0.0007	0.0010
				175	2.1	0.0026	0.0071	0.0005	0.0007
				250	2.0	0.0031	0.0096	0.0006	0.0009
				500	5.0	0.0120	0.0377	0.0020	0.0032
				750	0.7	0.0026	0.0080	0.0004	0.0007
				1000	1.1	0.0079	0.0224	0.0011	0.0020
				1500	1.1	0.0110	0.0312	0.0016	0.0028
				2000	0.5	0.0067	0.0189	0.0010	0.0017
				3000	0.8	0.0152	0.0433	0.0022	0.0039
				10000	0.0	0.0010	0.0029	0.0001	0.0003
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0017	0.0041	0.0004	0.0005
				120	4.2	0.0017	0.0041	0.0004	0.0005
				175	0.0	0.0016	0.0043	0.0003	0.0004
				175	3.1	0.0016	0.0043	0.0003	0.0004
				250	0.0	0.0019	0.0058	0.0003	0.0005
				250	2.9	0.0019	0.0058	0.0003	0.0005
				500	0.0	0.0060	0.0191	0.0010	0.0016
				500	5.9	0.0060	0.0191	0.0010	0.0016
				750	0.0	0.0085	0.0267	0.0014	0.0022
				750	4.6	0.0085	0.0267	0.0014	0.0022
				1000	0.0	0.0021	0.0060	0.0003	0.0005
				1000	0.7	0.0021	0.0060	0.0003	0.0005
				1500	0.0	0.0066	0.0190	0.0009	0.0017
				1500	1.5	0.0066	0.0190	0.0009	0.0017
				2000	0.0	0.0046	0.0130	0.0006	0.0011
				2000	0.9	0.0046	0.0130	0.0006	0.0011
				3000	0.0	0.0104	0.0298	0.0015	0.0026
				3000	1.3	0.0104	0.0298	0.0015	0.0026
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	15.1	0.0002	0.0002	0.0000	0.0001
				120	98.1	0.0023	0.0058	0.0004	0.0007
				175	61.2	0.0022	0.0061	0.0003	0.0005
				250	59.0	0.0027	0.0086	0.0004	0.0007
				500	146.1	0.0101	0.0327	0.0015	0.0025
				750	19.4	0.0022	0.0071	0.0003	0.0006
				1000	32.8	0.0066	0.0196	0.0009	0.0016
				1500	32.8	0.0092	0.0273	0.0013	0.0022
				2000	14.3	0.0056	0.0166	0.0008	0.0014
				3000	23.1	0.0128	0.0379	0.0018	0.0031
				10000	0.8	0.0009	0.0025	0.0001	0.0002
			Backup Pumps	50	9.9	0.0001	0.0002	0.0000	0.0000
				120	63.8	0.0015	0.0038	0.0003	0.0004
				175	39.8	0.0014	0.0039	0.0002	0.0003
				250	38.4	0.0017	0.0053	0.0002	0.0004
				500	95.1	0.0067	0.0218	0.0010	0.0017
				750	12.6	0.0014	0.0046	0.0002	0.0004
				1000	21.3	0.0043	0.0128	0.0006	0.0010
				1500	21.4	0.0060	0.0178	0.0009	0.0015
				2000	9.3	0.0036	0.0108	0.0005	0.0009
				3000	15.0	0.0083	0.0247	0.0012	0.0020
				10000	0.5	0.0006	0.0016	0.0001	0.0001

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
		Contra Costa	Prime Generators	50	0.5	0.0003	0.0003	0.0000	0.0001
				120	3.4	0.0029	0.0073	0.0007	0.0010
				175	2.1	0.0027	0.0074	0.0005	0.0007
				250	2.1	0.0034	0.0103	0.0006	0.0009
				500	5.1	0.0119	0.0374	0.0020	0.0031
				750	0.7	0.0026	0.0082	0.0004	0.0007
				1000	1.1	0.0080	0.0228	0.0011	0.0020
				1500	1.1	0.0112	0.0318	0.0016	0.0029
				2000	0.5	0.0068	0.0193	0.0010	0.0017
				3000	0.8	0.0155	0.0441	0.0022	0.0040
				10000	0.0	0.0010	0.0029	0.0001	0.0003
			Prime Pumps	50	0.3	0.0002	0.0002	0.0000	0.0001
				120	2.2	0.0019	0.0047	0.0005	0.0006
				175	1.4	0.0017	0.0047	0.0003	0.0005
				250	1.3	0.0021	0.0064	0.0004	0.0006
				500	3.3	0.0079	0.0250	0.0014	0.0021
				750	0.4	0.0017	0.0053	0.0003	0.0005
				1000	0.7	0.0052	0.0148	0.0007	0.0013
				1500	0.7	0.0073	0.0207	0.0010	0.0019
				2000	0.3	0.0044	0.0125	0.0006	0.0011
				3000	0.5	0.0101	0.0287	0.0014	0.0026
				10000	0.0	0.0007	0.0019	0.0001	0.0002
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0011	0.0027	0.0003	0.0004
				120	2.8	0.0011	0.0027	0.0003	0.0004
				175	0.0	0.0010	0.0028	0.0002	0.0[illegible]
				175	2.0	0.0010	0.0028	0.0002	0.0[illegible]
				250	0.0	0.0013	0.0039	0.0002	0.0003
				250	1.9	0.0013	0.0039	0.0002	0.0003
				500	0.0	0.0040	0.0127	0.0007	0.0010
				500	3.9	0.0040	0.0127	0.0007	0.0010
				750	0.0	0.0056	0.0177	0.0009	0.0015
				750	3.1	0.0056	0.0177	0.0009	0.0015
				1000	0.0	0.0014	0.0040	0.0002	0.0003
				1000	0.4	0.0014	0.0040	0.0002	0.0003
				1500	0.0	0.0044	0.0126	0.0006	0.0011
				1500	1.0	0.0044	0.0126	0.0006	0.0011
				2000	0.0	0.0030	0.0086	0.0004	0.0008
				2000	0.6	0.0030	0.0086	0.0004	0.0008
				3000	0.0	0.0069	0.0197	0.0010	0.0017
				3000	0.9	0.0069	0.0197	0.0010	0.0017
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	10.0	0.0001	0.0002	0.0000	0.0000
				120	65.0	0.0015	0.0039	0.0003	0.0004
				175	40.5	0.0014	0.0040	0.0002	0.0004
				250	39.1	0.0018	0.0057	0.0003	0.0005
				500	96.8	0.0067	0.0217	0.0010	0.0017
				750	12.9	0.0015	0.0047	0.0002	0.0004
				1000	21.7	0.0044	0.0130	0.0006	0.0011
				1500	21.7	0.0061	0.0181	0.0009	0.0015
				2000	9.4	0.0037	0.0110	0.0005	0.0009
				3000	15.3	0.0085	0.0251	0.0012	0.0021
				10000	0.5	0.0006	0.0017	0.0001	0.0001
			Backup Pumps	50	6.5	0.0001	0.0001	0.0000	0.0000
				120	42.3	0.0010	0.0025	0.0002	0.0003
				175	26.4	0.0009	0.0026	0.0001	0.0[illegible]
				250	25.4	0.0011	0.0035	0.0002	0.0[illegible]
				500	63.0	0.0045	0.0145	0.0006	0.0011
				750	8.4	0.0010	0.0031	0.0001	0.0002

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				1000	14.1	0.0028	0.0085	0.0004	0.0007
				1500	14.1	0.0040	0.0118	0.0006	0.0010
				2000	6.1	0.0024	0.0071	0.0003	0.0006
				3000	9.9	0.0055	0.0164	0.0008	0.0013
				10000	0.3	0.0004	0.0011	0.0001	0.0001
		Marin	Prime Generators	50	0.1	0.0001	0.0001	0.0000	0.0000
				120	0.9	0.0007	0.0018	0.0002	0.0002
				175	0.5	0.0007	0.0019	0.0001	0.0002
				250	0.5	0.0008	0.0026	0.0002	0.0002
				500	1.3	0.0030	0.0094	0.0005	0.0008
				750	0.2	0.0007	0.0021	0.0001	0.0002
				1000	0.3	0.0020	0.0058	0.0003	0.0005
				1500	0.3	0.0028	0.0080	0.0004	0.0007
				2000	0.1	0.0017	0.0049	0.0002	0.0004
				3000	0.2	0.0039	0.0111	0.0006	0.0010
				10000	0.0	0.0003	0.0007	0.0000	0.0001
			Prime Pumps	50	0.1	0.0001	0.0001	0.0000	0.0000
				120	0.6	0.0005	0.0012	0.0001	0.0002
				175	0.4	0.0004	0.0012	0.0001	0.0001
				250	0.3	0.0005	0.0016	0.0001	0.0001
				500	0.8	0.0020	0.0063	0.0003	0.0005
				750	0.1	0.0004	0.0013	0.0001	0.0001
				1000	0.2	0.0013	0.0037	0.0002	0.0003
				1500	0.2	0.0018	0.0052	0.0003	0.0005
				2000	0.1	0.0011	0.0032	0.0002	0.0003
				3000	0.1	0.0025	0.0072	0.0004	0.0007
				10000	0.0	0.0002	0.0005	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0003	0.0007	0.0001	0.0001
				120	0.7	0.0003	0.0007	0.0001	0.0001
				175	0.0	0.0003	0.0007	0.0000	0.0001
				175	0.5	0.0003	0.0007	0.0000	0.0001
				250	0.0	0.0003	0.0010	0.0001	0.0001
				250	0.5	0.0003	0.0010	0.0001	0.0001
				500	0.0	0.0010	0.0032	0.0002	0.0003
				500	1.0	0.0010	0.0032	0.0002	0.0003
				750	0.0	0.0014	0.0045	0.0002	0.0004
				750	0.8	0.0014	0.0045	0.0002	0.0004
				1000	0.0	0.0004	0.0010	0.0000	0.0001
				1000	0.1	0.0004	0.0010	0.0000	0.0001
				1500	0.0	0.0011	0.0032	0.0002	0.0003
				1500	0.3	0.0011	0.0032	0.0002	0.0003
				2000	0.0	0.0008	0.0022	0.0001	0.0002
				2000	0.1	0.0008	0.0022	0.0001	0.0002
				3000	0.0	0.0017	0.0050	0.0002	0.0004
				3000	0.2	0.0017	0.0050	0.0002	0.0004
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	2.5	0.0000	0.0000	0.0000	0.0000
				120	16.4	0.0004	0.0010	0.0001	0.0001
				175	10.2	0.0004	0.0010	0.0001	0.0001
				250	9.9	0.0005	0.0014	0.0001	0.0001
				500	24.4	0.0017	0.0055	0.0002	0.0004
				750	3.2	0.0004	0.0012	0.0001	0.0001
				1000	5.5	0.0011	0.0033	0.0002	0.0003
				1500	5.5	0.0015	0.0046	0.0002	0.0004
				2000	2.4	0.0009	0.0028	0.0001	0.0002
				3000	3.9	0.0021	0.0063	0.0003	0.0005
				10000	0.1	0.0001	0.0004	0.0000	0.0000
			Backup Pumps	50	1.6	0.0000	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				120	10.7	0.0002	0.0006	0.0000	0.0001
				175	6.7	0.0002	0.0007	0.0000	0.0001
				250	6.4	0.0003	0.0009	0.0000	0.0001
				500	15.9	0.0011	0.0036	0.0002	0.0003
				750	2.1	0.0002	0.0008	0.0000	0.0001
				1000	3.6	0.0007	0.0021	0.0001	0.0002
				1500	3.6	0.0010	0.0030	0.0001	0.0002
				2000	1.6	0.0006	0.0018	0.0001	0.0001
				3000	2.5	0.0014	0.0041	0.0002	0.0003
				10000	0.1	0.0001	0.0003	0.0000	0.0000
		Napa	Prime Generators	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.4	0.0004	0.0009	0.0001	0.0001
				175	0.3	0.0004	0.0010	0.0001	0.0001
				250	0.3	0.0004	0.0013	0.0001	0.0001
				500	0.7	0.0016	0.0049	0.0003	0.0004
				750	0.1	0.0003	0.0011	0.0001	0.0001
				1000	0.1	0.0010	0.0030	0.0001	0.0003
				1500	0.1	0.0015	0.0041	0.0002	0.0004
				2000	0.1	0.0009	0.0025	0.0001	0.0002
				3000	0.1	0.0020	0.0058	0.0003	0.0005
				10000	0.0	0.0001	0.0004	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.3	0.0002	0.0006	0.0001	0.0001
				175	0.2	0.0002	0.0006	0.0000	0.0001
				250	0.2	0.0003	0.0008	0.0000	0.0001
				500	0.4	0.0010	0.0033	0.0002	0.00[illegible]
				750	0.1	0.0002	0.0007	0.0000	0.0[illegible]
				1000	0.1	0.0007	0.0019	0.0001	0.00[illegible]
				1500	0.1	0.0010	0.0027	0.0001	0.0002
				2000	0.0	0.0006	0.0016	0.0001	0.0001
				3000	0.1	0.0013	0.0037	0.0002	0.0003
				10000	0.0	0.0001	0.0003	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0001	0.0004	0.0000	0.0000
				120	0.4	0.0001	0.0004	0.0000	0.0000
				175	0.0	0.0001	0.0004	0.0000	0.0000
				175	0.3	0.0001	0.0004	0.0000	0.0000
				250	0.0	0.0002	0.0005	0.0000	0.0000
				250	0.2	0.0002	0.0005	0.0000	0.0000
				500	0.0	0.0005	0.0017	0.0001	0.0001
				500	0.5	0.0005	0.0017	0.0001	0.0001
				750	0.0	0.0007	0.0023	0.0001	0.0002
				750	0.4	0.0007	0.0023	0.0001	0.0002
				1000	0.0	0.0002	0.0005	0.0000	0.0000
				1000	0.1	0.0002	0.0005	0.0000	0.0000
				1500	0.0	0.0006	0.0016	0.0001	0.0001
				1500	0.1	0.0006	0.0016	0.0001	0.0001
				2000	0.0	0.0004	0.0011	0.0001	0.0001
				2000	0.1	0.0004	0.0011	0.0001	0.0001
				3000	0.0	0.0009	0.0026	0.0001	0.0002
				3000	0.1	0.0009	0.0026	0.0001	0.0002
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	1.3	0.0000	0.0000	0.0000	0.0000
				120	8.5	0.0002	0.0005	0.0000	0.0001
				175	5.3	0.0002	0.0005	0.0000	0.0000
				250	5.1	0.0002	0.0007	0.0000	0.0[illegible]
				500	12.6	0.0009	0.0028	0.0001	0.0[illegible]
				750	1.7	0.0002	0.0006	0.0000	0.0000
				1000	2.8	0.0006	0.0017	0.0001	0.0001

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				1500	2.8	0.0008	0.0024	0.0001	0.0002
				2000	1.2	0.0005	0.0014	0.0001	0.0001
				3000	2.0	0.0011	0.0033	0.0002	0.0003
				10000	0.1	0.0001	0.0002	0.0000	0.0000
			Backup Pumps	50	0.9	0.0000	0.0000	0.0000	0.0000
				120	5.5	0.0001	0.0003	0.0000	0.0000
				175	3.4	0.0001	0.0003	0.0000	0.0000
				250	3.3	0.0001	0.0005	0.0000	0.0000
				500	8.2	0.0006	0.0019	0.0001	0.0001
				750	1.1	0.0001	0.0004	0.0000	0.0000
				1000	1.8	0.0004	0.0011	0.0001	0.0001
				1500	1.8	0.0005	0.0015	0.0001	0.0001
				2000	0.8	0.0003	0.0009	0.0000	0.0001
				3000	1.3	0.0007	0.0021	0.0001	0.0002
				10000	0.0	0.0000	0.0001	0.0000	0.0000
		San Francisco	Prime Generators	50	0.4	0.0003	0.0002	0.0000	0.0001
				120	2.7	0.0023	0.0058	0.0006	0.0008
				175	1.7	0.0022	0.0059	0.0004	0.0006
				250	1.6	0.0027	0.0082	0.0005	0.0007
				500	4.1	0.0095	0.0300	0.0016	0.0025
				750	0.5	0.0021	0.0065	0.0004	0.0006
				1000	0.9	0.0064	0.0182	0.0009	0.0016
				1500	0.9	0.0089	0.0254	0.0013	0.0023
				2000	0.4	0.0054	0.0154	0.0008	0.0014
				3000	0.6	0.0124	0.0353	0.0018	0.0032
				10000	0.0	0.0008	0.0024	0.0001	0.0002
			Prime Pumps	50	0.3	0.0002	0.0002	0.0000	0.0001
				120	1.8	0.0015	0.0038	0.0004	0.0005
				175	1.1	0.0014	0.0038	0.0002	0.0004
				250	1.1	0.0017	0.0051	0.0003	0.0005
				500	2.7	0.0063	0.0200	0.0011	0.0017
				750	0.4	0.0014	0.0043	0.0002	0.0004
				1000	0.6	0.0042	0.0119	0.0006	0.0011
				1500	0.6	0.0058	0.0165	0.0008	0.0015
				2000	0.3	0.0035	0.0100	0.0005	0.0009
				3000	0.4	0.0081	0.0230	0.0012	0.0021
				10000	0.0	0.0005	0.0015	0.0001	0.0001
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0009	0.0022	0.0002	0.0003
				120	2.2	0.0009	0.0022	0.0002	0.0003
				175	0.0	0.0008	0.0023	0.0001	0.0002
				175	1.6	0.0008	0.0023	0.0001	0.0002
				250	0.0	0.0010	0.0031	0.0002	0.0003
				250	1.5	0.0010	0.0031	0.0002	0.0003
				500	0.0	0.0032	0.0101	0.0005	0.0008
				500	3.1	0.0032	0.0101	0.0005	0.0008
				750	0.0	0.0045	0.0142	0.0007	0.0012
				750	2.4	0.0045	0.0142	0.0007	0.0012
				1000	0.0	0.0011	0.0032	0.0002	0.0003
				1000	0.3	0.0011	0.0032	0.0002	0.0003
				1500	0.0	0.0035	0.0100	0.0005	0.0009
				1500	0.8	0.0035	0.0100	0.0005	0.0009
				2000	0.0	0.0024	0.0069	0.0003	0.0006
				2000	0.5	0.0024	0.0069	0.0003	0.0006
				3000	0.0	0.0055	0.0158	0.0008	0.0014
				3000	0.7	0.0055	0.0158	0.0008	0.0014
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	8.0	0.0001	0.0001	0.0000	0.0000
				120	52.0	0.0012	0.0031	0.0002	0.0004

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				175	32.4	0.0011	0.0032	0.0002	0.0003
				250	31.3	0.0015	0.0046	0.0002	0.0004
				500	77.4	0.0054	0.0174	0.0008	0.0013
				750	10.3	0.0012	0.0038	0.0002	0.0003
				1000	17.4	0.0035	0.0104	0.0005	0.0008
				1500	17.4	0.0049	0.0145	0.0007	0.0012
				2000	7.6	0.0030	0.0088	0.0004	0.0007
				3000	12.2	0.0068	0.0201	0.0010	0.0016
				10000	0.4	0.0005	0.0013	0.0001	0.0001
			Backup Pumps	50	5.2	0.0001	0.0001	0.0000	0.0000
				120	33.8	0.0008	0.0020	0.0001	0.0002
				175	21.1	0.0007	0.0021	0.0001	0.0002
				250	20.3	0.0009	0.0028	0.0001	0.0002
				500	50.4	0.0036	0.0116	0.0005	0.0009
				750	6.7	0.0008	0.0025	0.0001	0.0002
				1000	11.3	0.0023	0.0068	0.0003	0.0006
				1500	11.3	0.0032	0.0094	0.0005	0.0008
				2000	4.9	0.0019	0.0057	0.0003	0.0005
				3000	8.0	0.0044	0.0131	0.0006	0.0011
				10000	0.3	0.0003	0.0009	0.0000	0.0001
		San Mateo	Prime Generators	50	0.4	0.0002	0.0002	0.0000	0.0001
				120	2.5	0.0021	0.0053	0.0005	0.0007
				175	1.5	0.0020	0.0053	0.0004	0.0005
				250	1.5	0.0024	0.0074	0.0004	0.0007
				500	3.7	0.0086	0.0271	0.0015	0.0023
				750	0.5	0.0019	0.0059	0.0003	0.00[illegible]
				1000	0.8	0.0058	0.0165	0.0008	0.0[illegible]
				1500	0.8	0.0081	0.0230	0.0012	0.00[illegible]
				2000	0.4	0.0049	0.0139	0.0007	0.0012
				3000	0.6	0.0112	0.0319	0.0016	0.0029
				10000	0.0	0.0007	0.0021	0.0001	0.0002
			Prime Pumps	50	0.2	0.0002	0.0001	0.0000	0.0001
				120	1.6	0.0014	0.0034	0.0003	0.0005
				175	1.0	0.0013	0.0034	0.0002	0.0003
				250	1.0	0.0015	0.0046	0.0003	0.0004
				500	2.4	0.0057	0.0181	0.0010	0.0015
				750	0.3	0.0012	0.0039	0.0002	0.0003
				1000	0.5	0.0038	0.0107	0.0005	0.0010
				1500	0.5	0.0053	0.0150	0.0008	0.0013
				2000	0.2	0.0032	0.0091	0.0005	0.0008
				3000	0.4	0.0073	0.0208	0.0010	0.0019
				10000	0.0	0.0005	0.0014	0.0001	0.0001
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0008	0.0020	0.0002	0.0003
				120	2.0	0.0008	0.0020	0.0002	0.0003
				175	0.0	0.0008	0.0020	0.0001	0.0002
				175	1.5	0.0008	0.0020	0.0001	0.0002
				250	0.0	0.0009	0.0028	0.0002	0.0002
				250	1.4	0.0009	0.0028	0.0002	0.0002
				500	0.0	0.0029	0.0092	0.0005	0.0007
				500	2.8	0.0029	0.0092	0.0005	0.0007
				750	0.0	0.0040	0.0128	0.0007	0.0011
				750	2.2	0.0040	0.0128	0.0007	0.0011
				1000	0.0	0.0010	0.0029	0.0001	0.0003
				1000	0.3	0.0010	0.0029	0.0001	0.0003
				1500	0.0	0.0032	0.0091	0.0004	0.0008
				1500	0.7	0.0032	0.0091	0.0004	0.0[illegible]
				2000	0.0	0.0022	0.0062	0.0003	0.0[illegible]
				2000	0.4	0.0022	0.0062	0.0003	0.0005
				3000	0.0	0.0050	0.0143	0.0007	0.0013

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				3000	0.6	0.0050	0.0143	0.0007	0.0013
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	7.3	0.0001	0.0001	0.0000	0.0000
				120	47.0	0.0011	0.0028	0.0002	0.0003
				175	29.3	0.0010	0.0029	0.0001	0.0003
				250	28.3	0.0013	0.0041	0.0002	0.0003
				500	70.0	0.0048	0.0157	0.0007	0.0012
				750	9.3	0.0011	0.0034	0.0002	0.0003
				1000	15.7	0.0032	0.0094	0.0004	0.0008
				1500	15.7	0.0044	0.0131	0.0006	0.0011
				2000	6.8	0.0027	0.0079	0.0004	0.0006
				3000	11.1	0.0061	0.0182	0.0009	0.0015
				10000	0.4	0.0004	0.0012	0.0001	0.0001
			Backup Pumps	50	4.7	0.0001	0.0001	0.0000	0.0000
				120	30.6	0.0007	0.0018	0.0001	0.0002
				175	19.1	0.0007	0.0019	0.0001	0.0002
				250	18.4	0.0008	0.0025	0.0001	0.0002
				500	45.5	0.0032	0.0105	0.0005	0.0008
				750	6.1	0.0007	0.0022	0.0001	0.0002
				1000	10.2	0.0021	0.0061	0.0003	0.0005
				1500	10.2	0.0029	0.0085	0.0004	0.0007
				2000	4.4	0.0017	0.0052	0.0002	0.0004
				3000	7.2	0.0040	0.0118	0.0006	0.0010
				10000	0.2	0.0003	0.0008	0.0000	0.0001
		Santa Clara	Prime Generators	50	0.9	0.0006	0.0005	0.0001	0.0002
				120	6.0	0.0051	0.0127	0.0013	0.0017
				175	3.7	0.0047	0.0128	0.0008	0.0013
				250	3.6	0.0059	0.0179	0.0011	0.0016
				500	8.9	0.0207	0.0652	0.0035	0.0055
				750	1.2	0.0045	0.0142	0.0008	0.0012
				1000	2.0	0.0140	0.0397	0.0020	0.0036
				1500	2.0	0.0195	0.0553	0.0028	0.0050
				2000	0.9	0.0118	0.0335	0.0017	0.0030
				3000	1.4	0.0270	0.0768	0.0039	0.0069
				10000	0.0	0.0018	0.0051	0.0003	0.0005
			Prime Pumps	50	0.6	0.0004	0.0004	0.0001	0.0002
				120	3.9	0.0033	0.0082	0.0008	0.0011
				175	2.4	0.0030	0.0082	0.0005	0.0008
				250	2.3	0.0036	0.0111	0.0007	0.0010
				500	5.8	0.0138	0.0435	0.0024	0.0036
				750	0.8	0.0030	0.0093	0.0005	0.0008
				1000	1.3	0.0091	0.0258	0.0013	0.0023
				1500	1.3	0.0127	0.0360	0.0018	0.0032
				2000	0.6	0.0077	0.0218	0.0011	0.0020
				3000	0.9	0.0176	0.0500	0.0025	0.0045
				10000	0.0	0.0012	0.0033	0.0002	0.0003
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0019	0.0048	0.0005	0.0006
				120	4.8	0.0019	0.0048	0.0005	0.0006
				175	0.0	0.0018	0.0049	0.0003	0.0005
				175	3.6	0.0018	0.0049	0.0003	0.0005
				250	0.0	0.0022	0.0067	0.0004	0.0006
				250	3.3	0.0022	0.0067	0.0004	0.0006
				500	0.0	0.0070	0.0221	0.0011	0.0018
				500	6.9	0.0070	0.0221	0.0011	0.0018
				750	0.0	0.0097	0.0308	0.0016	0.0025
				750	5.3	0.0097	0.0308	0.0016	0.0025
				1000	0.0	0.0024	0.0069	0.0003	0.0006
				1000	0.8	0.0024	0.0069	0.0003	0.0006

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day CO	NOx	PM	ROG
				1500	0.0	0.0077	0.0219	0.0011	0.0019
				1500	1.8	0.0077	0.0219	0.0011	0.0019
				2000	0.0	0.0053	0.0150	0.0007	0.0013
				2000	1.0	0.0053	0.0150	0.0007	0.0013
				3000	0.0	0.0120	0.0344	0.0017	0.0030
				3000	1.5	0.0120	0.0344	0.0017	0.0030
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	17.5	0.0002	0.0003	0.0000	0.0001
				120	113.1	0.0026	0.0067	0.0005	0.0008
				175	70.6	0.0025	0.0070	0.0004	0.0006
				250	68.0	0.0032	0.0099	0.0005	0.0008
				500	168.5	0.0116	0.0378	0.0017	0.0029
				750	22.4	0.0025	0.0082	0.0004	0.0006
				1000	37.8	0.0076	0.0226	0.0011	0.0018
				1500	37.9	0.0106	0.0315	0.0015	0.0026
				2000	16.4	0.0064	0.0191	0.0009	0.0016
				3000	26.6	0.0147	0.0438	0.0021	0.0036
				10000	0.9	0.0010	0.0029	0.0001	0.0002
			Backup Pumps	50	11.4	0.0001	0.0002	0.0000	0.0001
				120	73.6	0.0017	0.0044	0.0003	0.0005
				175	45.9	0.0016	0.0045	0.0002	0.0004
				250	44.3	0.0019	0.0061	0.0003	0.0005
				500	109.7	0.0078	0.0252	0.0011	0.0019
				750	14.6	0.0017	0.0054	0.0002	0.0004
				1000	24.6	0.0050	0.0147	0.0007	0.0012
				1500	24.6	0.0069	0.0205	0.0010	0.0017
				2000	10.7	0.0042	0.0124	0.0006	0.
				3000	17.3	0.0096	0.0285	0.0014	0.0[illegible]
				10000	0.6	0.0006	0.0019	0.0001	0.0002
		Solano	Prime Generators	50	0.2	0.0001	0.0001	0.0000	0.0000
				120	1.0	0.0008	0.0021	0.0002	0.0003
				175	0.6	0.0008	0.0021	0.0001	0.0002
				250	0.6	0.0010	0.0030	0.0002	0.0003
				500	1.5	0.0034	0.0107	0.0006	0.0009
				750	0.2	0.0007	0.0023	0.0001	0.0002
				1000	0.3	0.0023	0.0065	0.0003	0.0006
				1500	0.3	0.0032	0.0091	0.0005	0.0008
				2000	0.1	0.0019	0.0055	0.0003	0.0005
				3000	0.2	0.0045	0.0127	0.0006	0.0011
				10000	0.0	0.0003	0.0008	0.0000	0.0001
			Prime Pumps	50	0.1	0.0001	0.0001	0.0000	0.0000
				120	0.6	0.0005	0.0014	0.0001	0.0002
				175	0.4	0.0005	0.0014	0.0001	0.0001
				250	0.4	0.0006	0.0018	0.0001	0.0002
				500	1.0	0.0023	0.0072	0.0004	0.0006
				750	0.1	0.0005	0.0015	0.0001	0.0001
				1000	0.2	0.0015	0.0043	0.0002	0.0004
				1500	0.2	0.0021	0.0059	0.0003	0.0005
				2000	0.1	0.0013	0.0036	0.0002	0.0003
				3000	0.2	0.0029	0.0082	0.0004	0.0007
				10000	0.0	0.0002	0.0006	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0003	0.0008	0.0001	0.0001
				120	0.8	0.0003	0.0008	0.0001	0.0001
				175	0.0	0.0003	0.0008	0.0001	0.0001
				175	0.6	0.0003	0.0008	0.0001	0.[illegible]
				250	0.0	0.0004	0.0011	0.0001	0.
				250	0.5	0.0004	0.0011	0.0001	0.0001
				500	0.0	0.0011	0.0036	0.0002	0.0003

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				500	1.1	0.0011	0.0036	0.0002	0.0003
				750	0.0	0.0016	0.0051	0.0003	0.0004
				750	0.9	0.0016	0.0051	0.0003	0.0004
				1000	0.0	0.0004	0.0011	0.0001	0.0001
				1000	0.1	0.0004	0.0011	0.0001	0.0001
				1500	0.0	0.0013	0.0036	0.0002	0.0003
				1500	0.3	0.0013	0.0036	0.0002	0.0003
				2000	0.0	0.0009	0.0025	0.0001	0.0002
				2000	0.2	0.0009	0.0025	0.0001	0.0002
				3000	0.0	0.0020	0.0057	0.0003	0.0005
				3000	0.3	0.0020	0.0057	0.0003	0.0005
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	2.9	0.0000	0.0000	0.0000	0.0000
				120	18.7	0.0004	0.0011	0.0001	0.0001
				175	11.6	0.0004	0.0012	0.0001	0.0001
				250	11.2	0.0005	0.0016	0.0001	0.0001
				500	27.8	0.0019	0.0062	0.0003	0.0005
				750	3.7	0.0004	0.0014	0.0001	0.0001
				1000	6.2	0.0013	0.0037	0.0002	0.0003
				1500	6.2	0.0018	0.0052	0.0002	0.0004
				2000	2.7	0.0011	0.0031	0.0002	0.0003
				3000	4.4	0.0024	0.0072	0.0003	0.0006
				10000	0.2	0.0002	0.0005	0.0000	0.0000
			Backup Pumps	50	1.9	0.0000	0.0000	0.0000	0.0000
				120	12.1	0.0003	0.0007	0.0001	0.0001
				175	7.6	0.0003	0.0007	0.0000	0.0001
				250	7.3	0.0003	0.0010	0.0000	0.0001
				500	18.1	0.0013	0.0042	0.0002	0.0003
				750	2.4	0.0003	0.0009	0.0000	0.0001
				1000	4.1	0.0008	0.0024	0.0001	0.0002
				1500	4.1	0.0011	0.0034	0.0002	0.0003
				2000	1.8	0.0007	0.0020	0.0001	0.0002
				3000	2.9	0.0016	0.0047	0.0002	0.0004
				10000	0.1	0.0001	0.0003	0.0000	0.0000
		Sonoma	Prime Generators	50	0.2	0.0001	0.0001	0.0000	0.0001
				120	1.4	0.0012	0.0030	0.0003	0.0004
				175	0.9	0.0011	0.0031	0.0002	0.0003
				250	0.9	0.0014	0.0043	0.0003	0.0004
				500	2 1	0.0050	0.0156	0.0008	0.0013
				750	0.3	0.0011	0.0034	0.0002	0.0003
				1000	0.5	0.0033	0.0095	0.0005	0.0009
				1500	0.5	0.0047	0.0133	0.0007	0.0012
				2000	0.2	0.0028	0.0080	0.0004	0.0007
				3000	0.3	0.0065	0.0184	0.0009	0.0017
				10000	0.0	0.0004	0.0012	0.0001	0.0001
			Prime Pumps	50	0.1	0.0001	0.0001	0.0000	0.0000
				120	0.9	0.0008	0.0020	0.0002	0.0003
				175	0.6	0.0007	0.0020	0.0001	0.0002
				250	0.6	0.0009	0.0027	0.0002	0.0002
				500	1.4	0.0033	0.0104	0.0006	0.0009
				750	0.2	0.0007	0.0022	0.0001	0.0002
				1000	0.3	0.0022	0.0062	0.0003	0.0006
				1500	0.3	0.0030	0.0086	0.0004	0.0008
				2000	0.1	0.0018	0.0052	0.0003	0.0005
				3000	0.2	0.0042	0.0120	0.0006	0.0011
				10000	0.0	0.0003	0.0008	0.0000	0.0001
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0005	0.0011	0.0001	0.0001
				120	1.2	0.0005	0.0011	0.0001	0.0001

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day CO	NOx	PM	ROG
				175	0.0	0.0004	0.0012	0.0001	0.0001
				175	0.9	0.0004	0.0012	0.0001	0.0001
				250	0.0	0.0005	0.0016	0.0001	0.0001
				250	0.8	0.0005	0.0016	0.0001	0.0001
				500	0.0	0.0017	0.0053	0.0003	0.0004
				500	1.6	0.0017	0.0053	0.0003	0.0004
				750	0.0	0.0023	0.0074	0.0004	0.0006
				750	1.3	0.0023	0.0074	0.0004	0.0006
				1000	0.0	0.0006	0.0017	0.0001	0.0001
				1000	0.2	0.0006	0.0017	0.0001	0.0001
				1500	0.0	0.0018	0.0052	0.0003	0.0005
				1500	0.4	0.0018	0.0052	0.0003	0.0005
				2000	0.0	0.0013	0.0036	0.0002	0.0003
				2000	0.2	0.0013	0.0036	0.0002	0.0003
				3000	0.0	0.0029	0.0082	0.0004	0.0007
				3000	0.4	0.0029	0.0082	0.0004	0.0007
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	4.2	0.0000	0.0001	0.0000	0.0000
				120	27.1	0.0006	0.0016	0.0001	0.0002
				175	16.9	0.0006	0.0017	0.0001	0.0001
				250	16.3	0.0008	0.0024	0.0001	0.0002
				500	40.4	0.0028	0.0091	0.0004	0.0007
				750	5.4	0.0006	0.0020	0.0001	0.0002
				1000	9.1	0.0018	0.0054	0.0003	0.0004
				1500	9.1	0.0025	0.0076	0.0004	0.0006
				2000	3.9	0.0015	0.0046	0.0002	0.0004
				3000	6.4	0.0035	0.0105	0.0005	0.0[illegible]
				10000	0.2	0.0002	0.0007	0.0000	0.0[illegible]
			Backup Pumps	50	2.7	0.0000	0.0000	0.0000	0.0000
				120	17.7	0.0004	0.0010	0.0001	0.0001
				175	11.0	0.0004	0.0011	0.0001	0.0001
				250	10.6	0.0005	0.0015	0.0001	0.0001
				500	26.3	0.0019	0.0060	0.0003	0.0005
				750	3.5	0.0004	0.0013	0.0001	0.0001
				1000	5.9	0.0012	0.0035	0.0002	0.0003
				1500	5.9	0.0017	0.0049	0.0002	0.0004
				2000	2.6	0.0010	0.0030	0.0001	0.0002
				3000	4.2	0.0023	0.0068	0.0003	0.0006
				10000	0.1	0.0002	0.0005	0.0000	0.0000
Bay Area AQMD Total		0	0	0	4084.0	1.5569	4.5707	0.2385	0.4004
Butte County AQMD	Sacramento Valley	Butte	Prime Generators	50	0.1	0.0001	0.0001	0.0000	0.0000
				120	0.7	0.0006	0.0015	0.0002	0.0002
				175	0.5	0.0006	0.0016	0.0001	0.0002
				250	0.4	0.0007	0.0022	0.0001	0.0002
				500	1.1	0.0025	0.0079	0.0004	0.0007
				750	0.1	0.0006	0.0017	0.0001	0.0001
				1000	0.2	0.0017	0.0048	0.0002	0.0004
				1500	0.2	0.0024	0.0067	0.0003	0.0006
				2000	0.1	0.0014	0.0041	0.0002	0.0004
				3000	0.2	0.0033	0.0093	0.0005	0.0008
				10000	0.0	0.0002	0.0006	0.0000	0.0001
			Prime Pumps	50	0.1	0.0001	0.0000	0.0000	0.0000
				120	0.5	0.0004	0.0010	0.0001	0.0001
				175	0.3	0.0004	0.0010	0.0001	0.0001
				250	0.3	0.0004	0.0013	0.0001	0.0001
				500	0.7	0.0017	0.0053	0.0003	0.0[illegible]
				750	0.1	0.0004	0.0011	0.0001	0.0
				1000	0.2	0.0011	0.0031	0.0002	0.0003
				1500	0.2	0.0015	0.0044	0.0002	0.0004

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				2000	0.1	0.0009	0.0027	0.0001	0.0002
				3000	0.1	0.0021	0.0061	0.0003	0.0005
				10000	0.0	0.0001	0.0004	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	2.1	0.0000	0.0000	0.0000	0.0000
				120	13.7	0.0003	0.0008	0.0001	0.0001
				175	8.6	0.0003	0.0009	0.0000	0.0001
				250	8.3	0.0004	0.0012	0.0001	0.0001
				500	20.5	0.0014	0.0046	0.0002	0.0004
				750	2.7	0.0003	0.0010	0.0000	0.0001
				1000	4.6	0.0009	0.0027	0.0001	0.0002
				1500	4.6	0.0013	0.0038	0.0002	0.0003
				2000	2.0	0.0008	0.0023	0.0001	0.0002
				3000	3.2	0.0018	0.0053	0.0003	0.0004
				10000	0.1	0.0001	0.0004	0.0000	0.0000
			Backup Pumps	50	1.4	0.0000	0.0000	0.0000	0.0000
				120	8.9	0.0002	0.0005	0.0000	0.0001
				175	5.6	0.0002	0.0005	0.0000	0.0000
				250	5.4	0.0002	0.0007	0.0000	0.0001
				500	13.3	0.0009	0.0031	0.0001	0.0002
				750	1.8	0.0002	0.0007	0.0000	0.0001
				1000	3.0	0.0006	0.0018	0.0001	0.0001
				1500	3.0	0.0008	0.0025	0.0001	0.0002
				2000	1.3	0.0005	0.0015	0.0001	0.0001
				3000	2.1	0.0012	0.0035	0.0002	0.0003
				10000	0.1	0.0001	0.0002	0.0000	0.0000
Butte County AQMD Total		0	0	0	122.4	0.0359	0.1051	0.0055	0.0092
Calaveras County AQMD	Mountain Counties	Calaveras	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0003	0.0000	0.0000
				175	0.1	0.0001	0.0003	0.0000	0.0000
				250	0.1	0.0001	0.0004	0.0000	0.0000
				500	0.2	0.0005	0.0016	0.0001	0.0001
				750	0.0	0.0001	0.0004	0.0000	0.0000
				1000	0.0	0.0003	0.0010	0.0000	0.0001
				1500	0.0	0.0005	0.0014	0.0001	0.0001
				2000	0.0	0.0003	0.0008	0.0000	0.0001
				3000	0.0	0.0007	0.0019	0.0001	0.0002
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0002	0.0000	0.0000
				175	0.1	0.0001	0.0002	0.0000	0.0000
				250	0.1	0.0001	0.0003	0.0000	0.0000
				500	0.1	0.0003	0.0011	0.0001	0.0001
				750	0.0	0.0001	0.0002	0.0000	0.0000
				1000	0.0	0.0002	0.0006	0.0000	0.0001
				1500	0.0	0.0003	0.0009	0.0000	0.0001
				2000	0.0	0.0002	0.0005	0.0000	0.0000
				3000	0.0	0.0004	0.0012	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.4	0.0000	0.0000	0.0000	0.0000
				120	2.8	0.0001	0.0002	0.0000	0.0000
				175	1.7	0.0001	0.0002	0.0000	0.0000
				250	1.7	0.0001	0.0002	0.0000	0.0000
				500	4.1	0.0003	0.0009	0.0000	0.0001
				750	0.6	0.0001	0.0002	0.0000	0.0000
				1000	0.9	0.0002	0.0006	0.0000	0.0000
				1500	0.9	0.0003	0.0008	0.0000	0.0001
				2000	0.4	0.0002	0.0005	0.0000	0.0000
				3000	0.7	0.0004	0.0011	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Backup Pumps	50	0.3	0.0000	0.0000	0.0000	0.0000
				120	1.8	0.0000	0.0001	0.0000	0.0000
				175	1.1	0.0000	0.0001	0.0000	0.0000
				250	1.1	0.0000	0.0002	0.0000	0.0000
				500	2.7	0.0002	0.0006	0.0000	0.0
				750	0.4	0.0000	0.0001	0.0000	0.0000
				1000	0.6	0.0001	0.0004	0.0000	0.0000
				1500	0.6	0.0002	0.0005	0.0000	0.0000
				2000	0.3	0.0001	0.0003	0.0000	0.0000
				3000	0.4	0.0002	0.0007	0.0000	0.0001
				10000	0.0	0.0000	0.0000	0.0000	0.0000
Calaveras County AQMD Total		0	0	0	24.8	0.0073	0.0213	0.0011	0.0019
Colusa County APCD	Sacramento Valley	Colusa	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0001	0.0000	0.0000
				175	0.0	0.0001	0.0001	0.0000	0.0000
				250	0.0	0.0001	0.0002	0.0000	0.0000
				500	0.1	0.0002	0.0007	0.0000	0.0001
				750	0.0	0.0001	0.0002	0.0000	0.0000
				1000	0.0	0.0002	0.0005	0.0000	0.0000
				1500	0.0	0.0002	0.0006	0.0000	0.0001
				2000	0.0	0.0001	0.0004	0.0000	0.0000
				3000	0.0	0.0003	0.0009	0.0000	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0001	0.0000	0.0000
				175	0.0	0.0000	0.0001	0.0000	0.0000
				250	0.0	0.0000	0.0001	0.0000	0.0000
				500	0.1	0.0002	0.0005	0.0000	0.0000
				750	0.0	0.0000	0.0001	0.0000	0.0000
				1000	0.0	0.0001	0.0003	0.0000	0.0000
				1500	0.0	0.0001	0.0004	0.0000	0.0000
				2000	0.0	0.0001	0.0002	0.0000	0.0000
				3000	0.0	0.0002	0.0006	0.0000	0.0
				10000	0.0	0.0000	0.0000	0.0000	0.0
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.2	0.0000	0.0000	0.0000	0.0000
				120	1.3	0.0000	0.0001	0.0000	0.0000
				175	0.8	0.0000	0.0001	0.0000	0.0000
				250	0.8	0.0000	0.0001	0.0000	0.0000
				500	1.9	0.0001	0.0004	0.0000	0.0000
				750	0.3	0.0000	0.0001	0.0000	0.0000
				1000	0.4	0.0001	0.0003	0.0000	0.0000
				1500	0.4	0.0001	0.0004	0.0000	0.0000
				2000	0.2	0.0001	0.0002	0.0000	0.0000
				3000	0.3	0.0002	0.0005	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Pumps	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.8	0.0000	0.0000	0.0000	0.0000
				175	0.5	0.0000	0.0001	0.0000	0.0000
				250	0.5	0.0000	0.0001	0.0000	0.0000
				500	1.2	0.0001	0.0003	0.0000	0.0000
				750	0.2	0.0000	0.0001	0.0000	0.0000
				1000	0.3	0.0001	0.0002	0.0000	0.0000
				1500	0.3	0.0001	0.0002	0.0000	0.0000
				2000	0.1	0.0000	0.0001	0.0000	0.0000
				3000	0.2	0.0001	0.0003	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
Colusa County APCD Total		0	0	0	11.5	0.0034	0.0098	0.0005	0.0009
El Dorado County APCD	Lake Tahoe	El Dorado	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0003	0.0000	0.0000
				175	0.1	0.0001	0.0003	0.0000	0.0000
				250	0.1	0.0001	0.0004	0.0000	0.0000
				500	0.2	0.0004	0.0014	0.0001	0.0001
				750	0.0	0.0001	0.0003	0.0000	0.0000
				1000	0.0	0.0003	0.0008	0.0000	0.0001
				1500	0.0	0.0004	0.0012	0.0001	0.0001
				2000	0.0	0.0002	0.0007	0.0000	0.0001
				3000	0.0	0.0006	0.0016	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0002	0.0000	0.0000
				175	0.1	0.0001	0.0002	0.0000	0.0000
				250	0.0	0.0001	0.0002	0.0000	0.0000
				500	0.1	0.0003	0.0009	0.0000	0.0001
				750	0.0	0.0001	0.0002	0.0000	0.0000
				1000	0.0	0.0002	0.0005	0.0000	0.0000
				1500	0.0	0.0003	0.0008	0.0000	0.0001
				2000	0.0	0.0002	0.0005	0.0000	0.0000
				3000	0.0	0.0004	0.0010	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.4	0.0000	0.0000	0.0000	0.0000
				120	2.4	0.0001	0.0001	0.0000	0.0000
				175	1.5	0.0001	0.0001	0.0000	0.0000
				250	1.4	0.0001	0.0002	0.0000	0.0000
				500	3.5	0.0002	0.0008	0.0000	0.0001
				750	0.5	0.0001	0.0002	0.0000	0.0000
				1000	0.8	0.0002	0.0005	0.0000	0.0000
				1500	0.8	0.0002	0.0007	0.0000	0.0001
				2000	0.3	0.0001	0.0004	0.0000	0.0000
				3000	0.6	0.0003	0.0009	0.0000	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Backup Pumps	50	0.2	0.0000	0.0000	0.0000	0.0000
				120	1.5	0.0000	0.0001	0.0000	0.0000
				175	1.0	0.0000	0.0001	0.0000	0.0000
				250	0.9	0.0000	0.0001	0.0000	0.0000
				500	2.3	0.0002	0.0005	0.0000	0.0000
				750	0.3	0.0000	0.0001	0.0000	0.0000
				1000	0.5	0.0001	0.0003	0.0000	0.0000
				1500	0.5	0.0001	0.0004	0.0000	0.0000
				2000	0.2	0.0001	0.0003	0.0000	0.00[illegible]
				3000	0.4	0.0002	0.0006	0.0000	0.0
				10000	0.0	0.0000	0.0000	0.0000	0.00[illegible]
	Mountain Counties		Prime Generators	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.4	0.0004	0.0010	0.0001	0.0001
				175	0.3	0.0004	0.0010	0.0001	0.0001
				250	0.3	0.0004	0.0013	0.0001	0.0001
				500	0.7	0.0016	0.0049	0.0003	0.0004
				750	0.1	0.0003	0.0011	0.0001	0.0001
				1000	0.1	0.0010	0.0030	0.0002	0.0003
				1500	0.1	0.0015	0.0042	0.0002	0.0004
				2000	0.1	0.0009	0.0025	0.0001	0.0002
				3000	0.1	0.0020	0.0058	0.0003	0.0005
				10000	0.0	0.0001	0.0004	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.3	0.0003	0.0006	0.0001	0.0001
				175	0.2	0.0002	0.0006	0.0000	0.0001
				250	0.2	0.0003	0.0008	0.0000	0.0001
				500	0.4	0.0010	0.0033	0.0002	0.0003
				750	0.1	0.0002	0.0007	0.0000	0.0001
				1000	0.1	0.0007	0.0019	0.0001	0.0002
				1500	0.1	0.0010	0.0027	0.0001	0.0002
				2000	0.0	0.0006	0.0016	0.0001	0.0001
				3000	0.1	0.0013	0.0038	0.0002	0.0003
				10000	0.0	0.0001	0.0003	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0[illegible]
				1000	0.0	0.0000	0.0000	0.0000	0.0[illegible]
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	1.3	0.0000	0.0000	0.0000	0.0000
				120	8.5	0.0002	0.0005	0.0000	0.0001
				175	5.3	0.0002	0.0005	0.0000	0.0000
				250	5.1	0.0002	0.0007	0.0000	0.0001
				500	12.7	0.0009	0.0028	0.0001	0.0002
				750	1.7	0.0002	0.0006	0.0000	0.0000
				1000	2.8	0.0006	0.0017	0.0001	0.0001
				1500	2.8	0.0008	0.0024	0.0001	0.0002
				2000	1.2	0.0005	0.0014	0.0001	0.0001
				3000	2.0	0.0011	0.0033	0.0002	0.0003
				10000	0.1	0.0001	0.0002	0.0000	0.0000
			Backup Pumps	50	0.9	0.0000	0.0000	0.0000	0.0000
				120	5.5	0.0001	0.0003	0.0000	0.0000
				175	3.5	0.0001	0.0003	0.0000	0.0000
				250	3.3	0.0001	0.0005	0.0000	0.0000
				500	8.2	0.0006	0.0019	0.0001	0.0001
				750	1.1	0.0001	0.0004	0.0000	0.0000
				1000	1.8	0.0004	0.0011	0.0001	0.0001
				1500	1.9	0.0005	0.0015	0.0001	0.0001
				2000	0.8	0.0003	0.0009	0.0000	0.0001
				3000	1.3	0.0007	0.0021	0.0001	0.0002
				10000	0.0	0.0000	0.0001	0.0000	0.0000
El Dorado County APCD Total		0	0	0	96.8	0.0284	0.0831	0.0043	0.0073
eather River AQMD	Sacramento Valley	Sutter	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.3	0.0002	0.0006	0.0001	0.0001
				175	0.2	0.0002	0.0006	0.0000	0.0001
				250	0.2	0.0003	0.0009	0.0001	0.0001
				500	0.4	0.0010	0.0031	0.0002	0.0003
				750	0.1	0.0002	0.0007	0.0000	0.0001
				1000	0.1	0.0007	0.0019	0.0001	0.0002
				1500	0.1	0.0009	0.0027	0.0001	0.0002
				2000	0.0	0.0006	0.0016	0.0001	0.0001
				3000	0.1	0.0013	0.0037	0.0002	0.0003
				10000	0.0	0.0001	0.0002	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.2	0.0002	0.0004	0.0000	0.0001
				175	0.1	0.0001	0.0004	0.0000	0.0000
				250	0.1	0.0002	0.0005	0.0000	0.0000
				500	0.3	0.0007	0.0021	0.0001	0.0002
				750	0.0	0.0001	0.0004	0.0000	0.0000
				1000	0.1	0.0004	0.0012	0.0001	0.0001
				1500	0.1	0.0006	0.0017	0.0001	0.0002
				2000	0.0	0.0004	0.0010	0.0001	0.0001
				3000	0.0	0.0008	0.0024	0.0001	0.0002
				10000	0.0	0.0001	0.0002	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
			Backup Generators	50	0.8	0.0000	0.0000	0.0000	0.0000
				120	5.4	0.0001	0.0003	0.0000	0.0000
				175	3.4	0.0001	0.0003	0.0000	0.0000
				250	3.3	0.0002	0.0005	0.0000	0.0000
				500	8.1	0.0006	0.0018	0.0001	0.0001
				750	1.1	0.0001	0.0004	0.0000	0.0000
				1000	1.8	0.0004	0.0011	0.0001	0.0001
				1500	1.8	0.0005	0.0015	0.0001	0.0001
				2000	0.8	0.0003	0.0009	0.0000	0.0001
				3000	1.3	0.0007	0.0021	0.0001	0.0002
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Backup Pumps	50	0.5	0.0000	0.0000	0.0000	0.0000
				120	3.5	0.0001	0.0002	0.0000	0.0000
				175	2.2	0.0001	0.0002	0.0000	0.0000
				250	2.1	0.0001	0.0003	0.0000	0.0000
				500	5.3	0.0004	0.0012	0.0001	0.0001
				750	0.7	0.0001	0.0003	0.0000	0.0000
				1000	1.2	0.0002	0.0007	0.0000	0.0001
				1500	1.2	0.0003	0.0010	0.0000	0.0001
				2000	0.5	0.0002	0.0006	0.0000	0.0000
				3000	0.8	0.0005	0.0014	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
		Yuba	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.2	0.0002	0.0005	0.0000	0.0001
				175	0.1	0.0002	0.0005	0.0000	0.0000
				250	0.1	0.0002	0.0007	0.0000	0.0
				500	0.3	0.0008	0.0024	0.0001	0.0[illegible]
				750	0.0	0.0002	0.0005	0.0000	0.0000
				1000	0.1	0.0005	0.0014	0.0001	0.0001
				1500	0.1	0.0007	0.0020	0.0001	0.0002
				2000	0.0	0.0004	0.0012	0.0001	0.0001
				3000	0.1	0.0010	0.0028	0.0001	0.0003
				10000	0.0	0.0001	0.0002	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0003	0.0000	0.0000
				175	0.1	0.0001	0.0003	0.0000	0.0000
				250	0.1	0.0001	0.0004	0.0000	0.0000
				500	0.2	0.0005	0.0016	0.0001	0.0001
				750	0.0	0.0001	0.0003	0.0000	0.0000
				1000	0.0	0.0003	0.0009	0.0000	0.0001
				1500	0.0	0.0005	0.0013	0.0001	0.0001
				2000	0.0	0.0003	0.0008	0.0000	0.0001
				3000	0.0	0.0006	0.0018	0.0001	0.0002
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.6	0.0000	0.0000	0.0000	0.00[illegible]
				120	4.1	0.0001	0.0002	0.0000	0.0000
				175	2.6	0.0001	0.0003	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				250	2.5	0.0001	0.0004	0.0000	0.0000
				500	6.1	0.0004	0.0014	0.0001	0.0001
				750	0.8	0.0001	0.0003	0.0000	0.0000
				1000	1.4	0.0003	0.0008	0.0000	0.0001
				1500	1.4	0.0004	0.0011	0.0001	0.0001
				2000	0.6	0.0002	0.0007	0.0000	0.0001
				3000	1.0	0.0005	0.0016	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Backup Pumps	50	0.4	0.0000	0.0000	0.0000	0.0000
				120	2.7	0.0001	0.0002	0.0000	0.0000
				175	1.7	0.0001	0.0002	0.0000	0.0000
				250	1.6	0.0001	0.0002	0.0000	0.0000
				500	4.0	0.0003	0.0009	0.0000	0.0001
				750	0.5	0.0001	0.0002	0.0000	0.0000
				1000	0.9	0.0002	0.0005	0.0000	0.0000
				1500	0.9	0.0003	0.0007	0.0000	0.0001
				2000	0.4	0.0002	0.0005	0.0000	0.0000
				3000	0.6	0.0003	0.0010	0.0000	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
Feather River AQMD Total		0	0	0	84.9	0.0249	0.0729	0.0038	0.0064
Glenn County APCD	Sacramento Valley	Glenn	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0002	0.0000	0.0000
				175	0.1	0.0001	0.0002	0.0000	0.0000
				250	0.1	0.0001	0.0003	0.0000	0.0000
				500	0.1	0.0003	0.0010	0.0001	0.0001
				750	0.0	0.0001	0.0002	0.0000	0.0000
				1000	0.0	0.0002	0.0006	0.0000	0.0001
				1500	0.0	0.0003	0.0009	0.0000	0.0001
				2000	0.0	0.0002	0.0005	0.0000	0.0000
				3000	0.0	0.0004	0.0012	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0001	0.0000	0.0000
				175	0.0	0.0000	0.0001	0.0000	0.0000
				250	0.0	0.0001	0.0002	0.0000	0.0000
				500	0.1	0.0002	0.0007	0.0000	0.0001
				750	0.0	0.0000	0.0001	0.0000	0.0000
				1000	0.0	0.0001	0.0004	0.0000	0.0000
				1500	0.0	0.0002	0.0006	0.0000	0.0001
				2000	0.0	0.0001	0.0003	0.0000	0.0000
				3000	0.0	0.0003	0.0008	0.0000	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.3	0.0000	0.0000	0.0000	0.0000
				120	1.8	0.0000	0.0001	0.0000	0.0000
				175	1.1	0.0000	0.0001	0.0000	0.0000
				250	1.1	0.0000	0.0002	0.0000	0.0000
				500	2.6	0.0002	0.0006	0.0000	0.0000
				750	0.3	0.0000	0.0001	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				1000	0.6	0.0001	0.0004	0.0000	0.0000
				1500	0.6	0.0002	0.0005	0.0000	0.0000
				2000	0.3	0.0001	0.0003	0.0000	0.0000
				3000	0.4	0.0002	0.0007	0.0000	0.0001
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Pumps	50	0.2	0.0000	0.0000	0.0000	0.0000
				120	1.2	0.0000	0.0001	0.0000	0.0000
				175	0.7	0.0000	0.0001	0.0000	0.0000
				250	0.7	0.0000	0.0001	0.0000	0.0000
				500	1.7	0.0001	0.0004	0.0000	0.0000
				750	0.2	0.0000	0.0001	0.0000	0.0000
				1000	0.4	0.0001	0.0002	0.0000	0.0000
				1500	0.4	0.0001	0.0003	0.0000	0.0000
				2000	0.2	0.0001	0.0002	0.0000	0.0000
				3000	0.3	0.0001	0.0004	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
Glenn County APCD Total		0	0	0	15.7	0.0046	0.0135	0.0007	0.0012
Great Basin Unified APCD	Great Basin Valleys	Alpine	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0001	0.0000	0.[illegible]
				10000	0.0	0.0000	0.0000	0.0000	0.0[illegible]
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0000	0.0000	0.0000	0.0000
				175	0.1	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.1	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.[illegible]
				1000	0.0	0.0000	0.0000	0.0000	0.
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.1	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
		Inyo	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0001	0.0000	0.0000
				175	0.0	0.0001	0.0001	0.0000	0.0000
				250	0.0	0.0001	0.0002	0.0000	0.0000
				500	0.1	0.0002	0.0007	0.0000	0.0001
				750	0.0	0.0000	0.0002	0.0000	0.0000
				1000	0.0	0.0001	0.0004	0.0000	0.0000
				1500	0.0	0.0002	0.0006	0.0000	0.0001
				2000	0.0	0.0001	0.0004	0.0000	0.0000
				3000	0.0	0.0003	0.0008	0.0000	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0001	0.0000	0.0000
				175	0.0	0.0000	0.0001	0.0000	0.0000
				250	0.0	0.0000	0.0001	0.0000	0.0000
				500	0.1	0.0001	0.0005	0.0000	0.0000
				750	0.0	0.0000	0.0001	0.0000	0.0000
				1000	0.0	0.0001	0.0003	0.0000	0.0000
				1500	0.0	0.0001	0.0004	0.0000	0.0000
				2000	0.0	0.0001	0.0002	0.0000	0.0000
				3000	0.0	0.0002	0.0005	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.2	0.0000	0.0000	0.0000	0.0000
				120	1.2	0.0000	0.0001	0.0000	0.0000
				175	0.7	0.0000	0.0001	0.0000	0.0000
				250	0.7	0.0000	0.0001	0.0000	0.0000
				500	1.8	0.0001	0.0004	0.0000	0.0000
				750	0.2	0.0000	0.0001	0.0000	0.0000
				1000	0.4	0.0001	0.0002	0.0000	0.0000
				1500	0.4	0.0001	0.0003	0.0000	0.0000
				2000	0.2	0.0001	0.0002	0.0000	0.0000
				3000	0.3	0.0002	0.0005	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Pumps	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.8	0.0000	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				175	0.5	0.0000	0.0000	0.0000	0.0000
				250	0.5	0.0000	0.0001	0.0000	0.0000
				500	1.2	0.0001	0.0003	0.0000	0.0000
				750	0.2	0.0000	0.0001	0.0000	0.0000
				1000	0.3	0.0001	0.0002	0.0000	0.0000
				1500	0.3	0.0001	0.0002	0.0000	0.0000
				2000	0.1	0.0000	0.0001	0.0000	0.0000
				3000	0.2	0.0001	0.0003	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
		Mono	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0001	0.0000	0.0000
				175	0.0	0.0000	0.0001	0.0000	0.0000
				250	0.0	0.0000	0.0001	0.0000	0.0000
				500	0.1	0.0002	0.0005	0.0000	0.0000
				750	0.0	0.0000	0.0001	0.0000	0.0000
				1000	0.0	0.0001	0.0003	0.0000	0.0000
				1500	0.0	0.0002	0.0004	0.0000	0.0000
				2000	0.0	0.0001	0.0003	0.0000	0.0000
				3000	0.0	0.0002	0.0006	0.0000	0.0001
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0001	0.0000	0.0000
				175	0.0	0.0000	0.0001	0.0000	0.0000
				250	0.0	0.0000	0.0001	0.0000	0.0000
				500	0.0	0.0001	0.0003	0.0000	0.0000
				750	0.0	0.0000	0.0001	0.0000	0.0000
				1000	0.0	0.0001	0.0002	0.0000	0.0
				1500	0.0	0.0001	0.0003	0.0000	0.0
				2000	0.0	0.0001	0.0002	0.0000	0.0000
				3000	0.0	0.0001	0.0004	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.9	0.0000	0.0001	0.0000	0.0000
				175	0.5	0.0000	0.0001	0.0000	0.0000
				250	0.5	0.0000	0.0001	0.0000	0.0000
				500	1.3	0.0001	0.0003	0.0000	0.0000
				750	0.2	0.0000	0.0001	0.0000	0.0000
				1000	0.3	0.0001	0.0002	0.0000	0.0000
				1500	0.3	0.0001	0.0002	0.0000	0.0000
				2000	0.1	0.0000	0.0001	0.0000	0.0000
				3000	0.2	0.0001	0.0003	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Pumps	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.6	0.0000	0.0000	0.0000	0.0000
				175	0.4	0.0000	0.0000	0.0000	0.0
				250	0.3	0.0000	0.0000	0.0000	0.0
				500	0.9	0.0001	0.0002	0.0000	0.0000
				750	0.1	0.0000	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				1000	0.2	0.0000	0.0001	0.0000	0.0000
				1500	0.2	0.0001	0.0002	0.0000	0.0000
				2000	0.1	0.0000	0.0001	0.0000	0.0000
				3000	0.1	0.0001	0.0002	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
Great Basin Unified APCD Total		0	0	0	19.2	0.0056	0.0165	0.0009	0.0014
Imperial County APCD	Salton Sea	Imperial	Prime Generators	50	0.1	0.0001	0.0000	0.0000	0.0000
				120	0.5	0.0005	0.0011	0.0001	0.0001
				175	0.3	0.0004	0.0011	0.0001	0.0001
				250	0.3	0.0005	0.0016	0.0001	0.0001
				500	0.8	0.0018	0.0058	0.0003	0.0005
				750	0.1	0.0004	0.0013	0.0001	0.0001
				1000	0.2	0.0012	0.0035	0.0002	0.0003
				1500	0.2	0.0017	0.0049	0.0002	0.0004
				2000	0.1	0.0010	0.0030	0.0001	0.0003
				3000	0.1	0.0024	0.0068	0.0003	0.0006
				10000	0.0	0.0002	0.0005	0.0000	0.0000
			Prime Pumps	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.3	0.0003	0.0007	0.0001	0.0001
				175	0.2	0.0003	0.0007	0.0000	0.0001
				250	0.2	0.0003	0.0010	0.0001	0.0001
				500	0.5	0.0012	0.0038	0.0002	0.0003
				750	0.1	0.0003	0.0008	0.0000	0.0001
				1000	0.1	0.0008	0.0023	0.0001	0.0002
				1500	0.1	0.0011	0.0032	0.0002	0.0003
				2000	0.0	0.0007	0.0019	0.0001	0.0002
				3000	0.1	0.0016	0.0044	0.0002	0.0004
				10000	0.0	0.0001	0.0003	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	1.5	0.0000	0.0000	0.0000	0.0000
				120	10.0	0.0002	0.0006	0.0000	0.0001
				175	6.2	0.0002	0.0006	0.0000	0.0001
				250	6.0	0.0003	0.0009	0.0000	0.0001
				500	14.9	0.0010	0.0033	0.0001	0.0003
				750	2.0	0.0002	0.0007	0.0000	0.0001
				1000	3.3	0.0007	0.0020	0.0001	0.0002
				1500	3.3	0.0009	0.0028	0.0001	0.0002
				2000	1.5	0.0006	0.0017	0.0001	0.0001
				3000	2.4	0.0013	0.0039	0.0002	0.0003
				10000	0.1	0.0001	0.0003	0.0000	0.0000
			Backup Pumps	50	1.0	0.0000	0.0000	0.0000	0.0000
				120	6.5	0.0002	0.0004	0.0000	0.0000
				175	4.1	0.0001	0.0004	0.0000	0.0000
				250	3.9	0.0002	0.0005	0.0000	0.0000
				500	9.7	0.0007	0.0022	0.0001	0.0002
				750	1.3	0.0001	0.0005	0.0000	0.0000
				1000	2.2	0.0004	0.0013	0.0001	0.0001
				1500	2.2	0.0006	0.0018	0.0001	0.0001

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day CO	NOx	PM	ROG
				2000	0.9	0.0004	0.0011	0.0001	0.0001
				3000	1.5	0.0008	0.0025	0.0001	0.0002
				10000	0.1	0.0001	0.0002	0.0000	0.0000
Imperial County APCD Total		0	0	0	89.0	0.0261	0.0765	0.0040	0.0067
Kern County APCD	Mojave Desert	Kern	Prime Generators	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.4	0.0004	0.0009	0.0001	0.0001
				175	0.3	0.0003	0.0009	0.0001	0.0001
				250	0.2	0.0004	0.0012	0.0001	0.0001
				500	0.6	0.0014	0.0045	0.0002	0.0004
				750	0.1	0.0003	0.0010	0.0001	0.0001
				1000	0.1	0.0010	0.0027	0.0001	0.0002
				1500	0.1	0.0013	0.0038	0.0002	0.0003
				2000	0.1	0.0008	0.0023	0.0001	0.0002
				3000	0.1	0.0019	0.0053	0.0003	0.0005
				10000	0.0	0.0001	0.0004	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.3	0.0002	0.0006	0.0001	0.0001
				175	0.2	0.0002	0.0006	0.0000	0.0001
				250	0.2	0.0002	0.0008	0.0000	0.0001
				500	0.4	0.0009	0.0030	0.0002	0.0003
				750	0.1	0.0002	0.0006	0.0000	0.0001
				1000	0.1	0.0006	0.0018	0.0001	0.0002
				1500	0.1	0.0009	0.0025	0.0001	0.0002
				2000	0.0	0.0005	0.0015	0.0001	0.0001
				3000	0.1	0.0012	0.0034	0.0002	0.0003
				10000	0.0	0.0001	0.0002	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	1.2	0.0000	0.0000	0.0000	0.0000
				120	7.8	0.0002	0.0005	0.0000	0.0001
				175	4.9	0.0002	0.0005	0.0000	0.0000
				250	4.7	0.0002	0.0007	0.0000	0.0001
				500	11.6	0.0008	0.0026	0.0001	0.0002
				750	1.5	0.0002	0.0006	0.0000	0.0000
				1000	2.6	0.0005	0.0016	0.0001	0.0001
				1500	2.6	0.0007	0.0022	0.0001	0.0002
				2000	1.1	0.0004	0.0013	0.0001	0.0001
				3000	1.8	0.0010	0.0030	0.0001	0.0002
				10000	0.1	0.0001	0.0002	0.0000	0.0000
			Backup Pumps	50	0.8	0.0000	0.0000	0.0000	0.0000
				120	5.1	0.0001	0.0003	0.0000	0.0000
				175	3.2	0.0001	0.0003	0.0000	0.0000
				250	3.0	0.0001	0.0004	0.0000	0.0000
				500	7.5	0.0005	0.0017	0.0001	0.0001
				750	1.0	0.0001	0.0004	0.0000	0.0000
				1000	1.7	0.0003	0.0010	0.0000	0.0001
				1500	1.7	0.0005	0.0014	0.0001	0.0
				2000	0.7	0.0003	0.0009	0.0000	0.0
				3000	1.2	0.0007	0.0020	0.0001	0.0002
				10000	0.0	0.0000	0.0001	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
Kern County APCD Total	0	0	0		69.3	0.0203	0.0595	0.0031	0.0052
Lake County AQMD	Lake County	Lake	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.2	0.0002	0.0004	0.0000	0.0001
				175	0.1	0.0002	0.0005	0.0000	0.0000
				250	0.1	0.0002	0.0006	0.0000	0.0001
				500	0.3	0.0007	0.0023	0.0001	0.0002
				750	0.0	0.0002	0.0005	0.0000	0.0000
				1000	0.1	0.0005	0.0014	0.0001	0.0001
				1500	0.1	0.0007	0.0020	0.0001	0.0002
				2000	0.0	0.0004	0.0012	0.0001	0.0001
				3000	0.0	0.0010	0.0027	0.0001	0.0002
				10000	0.0	0.0001	0.0002	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0003	0.0000	0.0000
				175	0.1	0.0001	0.0003	0.0000	0.0000
				250	0.1	0.0001	0.0004	0.0000	0.0000
				500	0.2	0.0005	0.0015	0.0001	0.0001
				750	0.0	0.0001	0.0003	0.0000	0.0000
				1000	0.0	0.0003	0.0009	0.0000	0.0001
				1500	0.0	0.0005	0.0013	0.0001	0.0001
				2000	0.0	0.0003	0.0008	0.0000	0.0001
				3000	0.0	0.0006	0.0018	0.0001	0.0002
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.6	0.0000	0.0000	0.0000	0.0000
				120	4.0	0.0001	0.0002	0.0000	0.0000
				175	2.5	0.0001	0.0003	0.0000	0.0000
				250	2.4	0.0001	0.0004	0.0000	0.0000
				500	6.0	0.0004	0.0013	0.0001	0.0001
				750	0.8	0.0001	0.0003	0.0000	0.0000
				1000	1.3	0.0003	0.0008	0.0000	0.0001
				1500	1.3	0.0004	0.0011	0.0001	0.0001
				2000	0.6	0.0002	0.0007	0.0000	0.0001
				3000	0.9	0.0005	0.0016	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Backup Pumps	50	0.4	0.0000	0.0000	0.0000	0.0000
				120	2.6	0.0001	0.0002	0.0000	0.0000
				175	1.6	0.0001	0.0002	0.0000	0.0000
				250	1.6	0.0001	0.0002	0.0000	0.0000
				500	3.9	0.0003	0.0009	0.0000	0.0001
				750	0.5	0.0001	0.0002	0.0000	0.0000
				1000	0.9	0.0002	0.0005	0.0000	0.0000
				1500	0.9	0.0002	0.0007	0.0000	0.0001
				2000	0.4	0.0001	0.0004	0.0000	0.0000
				3000	0.6	0.0003	0.0010	0.0000	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
Lake County AQMD Total	0	0	0		35.8	0.0105	0.0308	0.0016	0.0027
Lassen County APCD	Northeast Plateau	Lassen	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				120	0.1	0.0001	0.0003	0.0000	0.0000
				175	0.1	0.0001	0.0003	0.0000	0.0000
				250	0.1	0.0001	0.0004	0.0000	0.0000
				500	0.2	0.0004	0.0013	0.0001	0.0001
				750	0.0	0.0001	0.0003	0.0000	0.0000
				1000	0.0	0.0003	0.0008	0.0000	0.0001
				1500	0.0	0.0004	0.0011	0.0001	0.0001
				2000	0.0	0.0002	0.0007	0.0000	0.0001
				3000	0.0	0.0005	0.0015	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0002	0.0000	0.0000
				175	0.0	0.0001	0.0002	0.0000	0.0000
				250	0.0	0.0001	0.0002	0.0000	0.0000
				500	0.1	0.0003	0.0009	0.0000	0.0001
				750	0.0	0.0001	0.0002	0.0000	0.0000
				1000	0.0	0.0002	0.0005	0.0000	0.0000
				1500	0.0	0.0003	0.0007	0.0000	0.0001
				2000	0.0	0.0002	0.0004	0.0000	0.0000
				3000	0.0	0.0003	0.0010	0.0000	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.00
				1000	0.0	0.0000	0.0000	0.0000	0.0C
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.3	0.0000	0.0000	0.0000	0.0000
				120	2.2	0.0001	0.0001	0.0000	0.0000
				175	1.4	0.0000	0.0001	0.0000	0.0000
				250	1.4	0.0001	0.0002	0.0000	0.0000
				500	3.3	0.0002	0.0008	0.0000	0.0001
				750	0.4	0.0001	0.0002	0.0000	0.0000
				1000	0.8	0.0002	0.0004	0.0000	0.0000
				1500	0.8	0.0002	0.0006	0.0000	0.0001
				2000	0.3	0.0001	0.0004	0.0000	0.0000
				3000	0.5	0.0003	0.0009	0.0000	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Backup Pumps	50	0.2	0.0000	0.0000	0.0000	0.0000
				120	1.5	0.0000	0.0001	0.0000	0.0000
				175	0.9	0.0000	0.0001	0.0000	0.0000
				250	0.9	0.0000	0.0001	0.0000	0.0000
				500	2.2	0.0002	0.0005	0.0000	0.0000
				750	0.3	0.0000	0.0001	0.0000	0.0000
				1000	0.5	0.0001	0.0003	0.0000	0.0000
				1500	0.5	0.0001	0.0004	0.0000	0.0000
				2000	0.2	0.0001	0.0002	0.0000	0.0000
				3000	0.3	0.0002	0.0006	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
Lassen County APCD Total		0	0	0	20.0	0.0059	0.0172	0.0009	0.0015
Mariposa County APCD	Mountain Counties	Mariposa	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0001	0.0000	0.000
				175	0.0	0.0000	0.0001	0.0000	0.0000
				250	0.0	0.0001	0.0002	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				500	0.1	0.0002	0.0007	0.0000	0.0001
				750	0.0	0.0000	0.0001	0.0000	0.0000
				1000	0.0	0.0001	0.0004	0.0000	0.0000
				1500	0.0	0.0002	0.0006	0.0000	0.0001
				2000	0.0	0.0001	0.0003	0.0000	0.0000
				3000	0.0	0.0003	0.0008	0.0000	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0001	0.0000	0.0000
				175	0.0	0.0000	0.0001	0.0000	0.0000
				250	0.0	0.0000	0.0001	0.0000	0.0000
				500	0.1	0.0001	0.0004	0.0000	0.0000
				750	0.0	0.0000	0.0001	0.0000	0.0000
				1000	0.0	0.0001	0.0003	0.0000	0.0000
				1500	0.0	0.0001	0.0004	0.0000	0.0000
				2000	0.0	0.0001	0.0002	0.0000	0.0000
				3000	0.0	0.0002	0.0005	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.2	0.0000	0.0000	0.0000	0.0000
				120	1.1	0.0000	0.0001	0.0000	0.0000
				175	0.7	0.0000	0.0001	0.0000	0.0000
				250	0.7	0.0000	0.0001	0.0000	0.0000
				500	1.7	0.0001	0.0004	0.0000	0.0000
				750	0.2	0.0000	0.0001	0.0000	0.0000
				1000	0.4	0.0001	0.0002	0.0000	0.0000
				1500	0.4	0.0001	0.0003	0.0000	0.0000
				2000	0.2	0.0001	0.0002	0.0000	0.0000
				3000	0.3	0.0001	0.0004	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Pumps	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.7	0.0000	0.0000	0.0000	0.0000
				175	0.5	0.0000	0.0000	0.0000	0.0000
				250	0.4	0.0000	0.0001	0.0000	0.0000
				500	1.1	0.0001	0.0003	0.0000	0.0000
				750	0.1	0.0000	0.0001	0.0000	0.0000
				1000	0.2	0.0001	0.0001	0.0000	0.0000
				1500	0.2	0.0001	0.0002	0.0000	0.0000
				2000	0.1	0.0000	0.0001	0.0000	0.0000
				3000	0.2	0.0001	0.0003	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
Mariposa County APCD Total		0	0	0	10.2	0.0030	0.0088	0.0005	0.0008
Mendocino County AQMD	North Coast	Mendocino	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.3	0.0003	0.0006	0.0001	0.0001
				175	0.2	0.0002	0.0007	0.0000	0.0001
				250	0.2	0.0003	0.0009	0.0001	0.0001
				500	0.5	0.0011	0.0033	0.0002	0.0003
				750	0.1	0.0002	0.0007	0.0000	0.0001

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				1000	0.1	0.0007	0.0020	0.0001	0.0002
				1500	0.1	0.0010	0.0028	0.0001	0.0003
				2000	0.0	0.0006	0.0017	0.0001	0.0002
				3000	0.1	0.0014	0.0039	0.0002	0.0004
				10000	0.0	0.0001	0.0003	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.2	0.0002	0.0004	0.0000	0.0001
				175	0.1	0.0002	0.0004	0.0000	0.0000
				250	0.1	0.0002	0.0006	0.0000	0.0001
				500	0.3	0.0007	0.0022	0.0001	0.0002
				750	0.0	0.0002	0.0005	0.0000	0.0000
				1000	0.1	0.0005	0.0013	0.0001	0.0001
				1500	0.1	0.0006	0.0018	0.0001	0.0002
				2000	0.0	0.0004	0.0011	0.0001	0.0001
				3000	0.0	0.0009	0.0026	0.0001	0.0002
				10000	0.0	0.0001	0.0002	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0[illegible]
			Backup Generators	50	0.9	0.0000	0.0000	0.0000	0.0[illegible]
				120	5.8	0.0001	0.0003	0.0000	0.0000
				175	3.6	0.0001	0.0004	0.0000	0.0000
				250	3.5	0.0002	0.0005	0.0000	0.0000
				500	8.6	0.0006	0.0019	0.0001	0.0001
				750	1.1	0.0001	0.0004	0.0000	0.0000
				1000	1.9	0.0004	0.0012	0.0001	0.0001
				1500	1.9	0.0005	0.0016	0.0001	0.0001
				2000	0.8	0.0003	0.0010	0.0000	0.0001
				3000	1.4	0.0008	0.0022	0.0001	0.0002
				10000	0.0	0.0001	0.0001	0.0000	0.0000
			Backup Pumps	50	0.6	0.0000	0.0000	0.0000	0.0000
				120	3.8	0.0001	0.0002	0.0000	0.0000
				175	2.3	0.0001	0.0002	0.0000	0.0000
				250	2.3	0.0001	0.0003	0.0000	0.0000
				500	5.6	0.0004	0.0013	0.0001	0.0001
				750	0.7	0.0001	0.0003	0.0000	0.0000
				1000	1.3	0.0003	0.0008	0.0000	0.0001
				1500	1.3	0.0004	0.0010	0.0001	0.0001
				2000	0.5	0.0002	0.0006	0.0000	0.0001
				3000	0.9	0.0005	0.0015	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
Mendocino County AQMD Total		0	0	0	51.5	0.0151	0.0442	0.0023	0.0039
Modoc County APCD	Northeast Plateau	Modoc	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0001	0.0000	0.0000
				175	0.0	0.0000	0.0001	0.0000	0.0000
				250	0.0	0.0000	0.0001	0.0000	0.0000
				500	0.0	0.0001	0.0004	0.0000	0.0[illegible]
				750	0.0	0.0000	0.0001	0.0000	0.0[illegible]
				1000	0.0	0.0001	0.0002	0.0000	0.0000
				1500	0.0	0.0001	0.0003	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				2000	0.0	0.0001	0.0002	0.0000	0.0000
				3000	0.0	0.0001	0.0004	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0001	0.0000	0.0000
				500	0.0	0.0001	0.0002	0.0000	0.0000
				750	0.0	0.0000	0.0001	0.0000	0.0000
				1000	0.0	0.0000	0.0001	0.0000	0.0000
				1500	0.0	0.0001	0.0002	0.0000	0.0000
				2000	0.0	0.0000	0.0001	0.0000	0.0000
				3000	0.0	0.0001	0.0003	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.6	0.0000	0.0000	0.0000	0.0000
				175	0.4	0.0000	0.0000	0.0000	0.0000
				250	0.4	0.0000	0.0001	0.0000	0.0000
				500	0.9	0.0001	0.0002	0.0000	0.0000
				750	0.1	0.0000	0.0000	0.0000	0.0000
				1000	0.2	0.0000	0.0001	0.0000	0.0000
				1500	0.2	0.0001	0.0002	0.0000	0.0000
				2000	0.1	0.0000	0.0001	0.0000	0.0000
				3000	0.1	0.0001	0.0002	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Pumps	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.4	0.0000	0.0000	0.0000	0.0000
				175	0.2	0.0000	0.0000	0.0000	0.0000
				250	0.2	0.0000	0.0000	0.0000	0.0000
				500	0.6	0.0000	0.0001	0.0000	0.0000
				750	0.1	0.0000	0.0000	0.0000	0.0000
				1000	0.1	0.0000	0.0001	0.0000	0.0000
				1500	0.1	0.0000	0.0001	0.0000	0.0000
				2000	0.1	0.0000	0.0001	0.0000	0.0000
				3000	0.1	0.0001	0.0002	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
Modoc County APCD Total		0	0	0	5.5	0.0016	0.0047	0.0002	0.0004
Mojave Desert AQMD	Mojave Desert	Riverside	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0001	0.0000	0.0000
				175	0.0	0.0000	0.0001	0.0000	0.0000
				250	0.0	0.0001	0.0002	0.0000	0.0000
				500	0.1	0.0002	0.0007	0.0000	0.0001
				750	0.0	0.0000	0.0001	0.0000	0.0000
				1000	0.0	0.0001	0.0004	0.0000	0.0000
				1500	0.0	0.0002	0.0006	0.0000	0.0001
				2000	0.0	0.0001	0.0003	0.0000	0.0000
				3000	0.0	0.0003	0.0008	0.0000	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/da CO	NOx	PM	ROG
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0001	0.0000	0.0000
				175	0.0	0.0000	0.0001	0.0000	0.0000
				250	0.0	0.0000	0.0001	0.0000	0.0000
				500	0.1	0.0001	0.0005	0.0000	0.0000
				750	0.0	0.0000	0.0001	0.0000	0.0000
				1000	0.0	0.0001	0.0003	0.0000	0.0000
				1500	0.0	0.0001	0.0004	0.0000	0.0000
				2000	0.0	0.0001	0.0002	0.0000	0.0000
				3000	0.0	0.0002	0.0005	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.2	0.0000	0.0000	0.0000	0.0000
				120	1.2	0.0000	0.0001	0.0000	0.0000
				175	0.7	0.0000	0.0001	0.0000	0.0000
				250	0.7	0.0000	0.0001	0.0000	0.0000
				500	1.7	0.0001	0.0004	0.0000	0
				750	0.2	0.0000	0.0001	0.0000	0.[illegible]
				1000	0.4	0.0001	0.0002	0.0000	0.0000
				1500	0.4	0.0001	0.0003	0.0000	0.0000
				2000	0.2	0.0001	0.0002	0.0000	0.0000
				3000	0.3	0.0002	0.0005	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Pumps	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.8	0.0000	0.0000	0.0000	0.0000
				175	0.5	0.0000	0.0000	0.0000	0.0000
				250	0.5	0.0000	0.0001	0.0000	0.0000
				500	1.1	0.0001	0.0003	0.0000	0.0000
				750	0.2	0.0000	0.0001	0.0000	0.0000
				1000	0.3	0.0001	0.0002	0.0000	0.0000
				1500	0.3	0.0001	0.0002	0.0000	0.0000
				2000	0.1	0.0000	0.0001	0.0000	0.0000
				3000	0.2	0.0001	0.0003	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
		San Bernardino	Prime Generators	50	0.2	0.0001	0.0001	0.0000	0.0001
				120	1.4	0.0012	0.0030	0.0003	0.0004
				175	0.9	0.0011	0.0030	0.0002	0.0003
				250	0.8	0.0014	0.0042	0.0002	0.0004
				500	2.1	0.0048	0.0153	0.0008	0.0013
				750	0.3	0.0011	0.0033	0.0002	0.0003
				1000	0.5	0.0033	0.0093	0.0005	0.0008
				1500	0.5	0.0046	0.0130	0.0007	0.0012
				2000	0.2	0.0028	0.0079	0.0004	0.0007
				3000	0.3	0.0063	0.0180	0.0009	0.0016
				10000	0.0	0.0004	0.0012	0.0001	0.0001
			Prime Pumps	50	0.1	0.0001	0.0001	0.0000	0.[illegible]
				120	0.9	0.0008	0.0019	0.0002	0.
				175	0.6	0.0007	0.0019	0.0001	0.0002
				250	0.5	0.0008	0.0026	0.0002	0.0002

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				500	1.4	0.0032	0.0102	0.0006	0.0009
				750	0.2	0.0007	0.0022	0.0001	0.0002
				1000	0.3	0.0021	0.0061	0.0003	0.0005
				1500	0.3	0.0030	0.0084	0.0004	0.0008
				2000	0.1	0.0018	0.0051	0.0003	0.0005
				3000	0.2	0.0041	0.0117	0.0006	0.0011
				10000	0.0	0.0003	0.0008	0.0000	0.0001
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	4.1	0.0000	0.0001	0.0000	0.0000
				120	26.5	0.0006	0.0016	0.0001	0.0002
				175	16.5	0.0006	0.0016	0.0001	0.0001
				250	15.9	0.0007	0.0023	0.0001	0.0002
				500	39.5	0.0027	0.0088	0.0004	0.0007
				750	5.2	0.0006	0.0019	0.0001	0.0001
				1000	8.9	0.0018	0.0053	0.0003	0.0004
				1500	8.9	0.0025	0.0074	0.0004	0.0006
				2000	3.9	0.0015	0.0045	0.0002	0.0004
				3000	6.2	0.0035	0.0103	0.0005	0.0008
				10000	0.2	0.0002	0.0007	0.0000	0.0001
			Backup Pumps	50	2.7	0.0000	0.0000	0.0000	0.0000
				120	17.3	0.0004	0.0010	0.0001	0.0001
				175	10.8	0.0004	0.0011	0.0001	0.0001
				250	10.4	0.0005	0.0014	0.0001	0.0001
				500	25.7	0.0018	0.0059	0.0003	0.0005
				750	3.4	0.0004	0.0013	0.0001	0.0001
				1000	5.8	0.0012	0.0034	0.0002	0.0003
				1500	5.8	0.0016	0.0048	0.0002	0.0004
				2000	2.5	0.0010	0.0029	0.0001	0.0002
				3000	4.1	0.0022	0.0067	0.0003	0.0005
				10000	0.1	0.0002	0.0004	0.0000	0.0000
Mojave Desert AQMD Total		0	0	0	246.5	0.0722	0.2116	0.0110	0.0186
Monterey Bay Unified APCD	North Central Coast	Monterey	Prime Generators	50	0.2	0.0001	0.0001	0.0000	0.0001
				120	1.4	0.0012	0.0030	0.0003	0.0004
				175	0.9	0.0011	0.0031	0.0002	0.0003
				250	0.9	0.0014	0.0043	0.0003	0.0004
				500	2.1	0.0050	0.0156	0.0008	0.0013
				750	0.3	0.0011	0.0034	0.0002	0.0003
				1000	0.5	0.0033	0.0095	0.0005	0.0009
				1500	0.5	0.0047	0.0133	0.0007	0.0012
				2000	0.2	0.0028	0.0080	0.0004	0.0007
				3000	0.3	0.0065	0.0184	0.0009	0.0017
				10000	0.0	0.0004	0.0012	0.0001	0.0001
			Prime Pumps	50	0.1	0.0001	0.0001	0.0000	0.0000
				120	0.9	0.0008	0.0020	0.0002	0.0003
				175	0.6	0.0007	0.0020	0.0001	0.0002
				250	0.6	0.0009	0.0027	0.0002	0.0002
				500	1.4	0.0033	0.0104	0.0006	0.0009
				750	0.2	0.0007	0.0022	0.0001	0.0002
				1000	0.3	0.0022	0.0062	0.0003	0.0006

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				1500	0.3	0.0030	0.0086	0.0004	0.0008
				2000	0.1	0.0018	0.0052	0.0003	0.0005
				3000	0.2	0.0042	0.0120	0.0006	0.0011
				10000	0.0	0.0003	0.0008	0.0000	0.0001
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0013	0.0042	0.0002	0.0003
				500	1.0	0.0013	0.0042	0.0002	0.0003
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	4.2	0.0000	0.0001	0.0000	0.0000
				120	27.1	0.0006	0.0016	0.0001	0.0002
				175	16.9	0.0006	0.0017	0.0001	0.0001
				250	16.3	0.0008	0.0024	0.0001	0.0002
				500	40.4	0.0028	0.0091	0.0004	0.0007
				750	5.4	0.0006	0.0020	0.0001	0.0002
				1000	9.1	0.0018	0.0054	0.0003	0.0004
				1500	9.1	0.0025	0.0076	0.0004	0.0006
				2000	3.9	0.0015	0.0046	0.0002	0.0004
				3000	6.4	0.0035	0.0105	0.0005	0.0[illegible]
				10000	0.2	0.0002	0.0007	0.0000	0.[illegible]
			Backup Pumps	50	2.7	0.0000	0.0000	0.0000	0.0[illegible]
				120	17.7	0.0004	0.0010	0.0001	0.0001
				175	11.0	0.0004	0.0011	0.0001	0.0001
				250	10.6	0.0005	0.0015	0.0001	0.0001
				500	26.3	0.0019	0.0060	0.0003	0.0005
				750	3.5	0.0004	0.0013	0.0001	0.0001
				1000	5.9	0.0012	0.0035	0.0002	0.0003
				1500	5.9	0.0017	0.0049	0.0002	0.0004
				2000	2.6	0.0010	0.0030	0.0001	0.0002
				3000	4.2	0.0023	0.0068	0.0003	0.0006
				10000	0.1	0.0002	0.0005	0.0000	0.0000
		San Benito	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.2	0.0002	0.0004	0.0000	0.0001
				175	0.1	0.0002	0.0004	0.0000	0.0000
				250	0.1	0.0002	0.0006	0.0000	0.0001
				500	0.3	0.0007	0.0021	0.0001	0.0002
				750	0.0	0.0001	0.0005	0.0000	0.0000
				1000	0.1	0.0005	0.0013	0.0001	0.0001
				1500	0.1	0.0006	0.0018	0.0001	0.0002
				2000	0.0	0.0004	0.0011	0.0001	0.0001
				3000	0.0	0.0009	0.0025	0.0001	0.0002
				10000	0.0	0.0001	0.0002	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0003	0.0000	0.0000
				175	0.1	0.0001	0.0003	0.0000	0.0000
				250	0.1	0.0001	0.0004	0.0000	0.0000
				500	0.2	0.0004	0.0014	0.0001	0.0001
				750	0.0	0.0001	0.0003	0.0000	0.0000
				1000	0.0	0.0003	0.0008	0.0000	0.[illegible]
				1500	0.0	0.0004	0.0012	0.0001	0.[illegible]
				2000	0.0	0.0003	0.0007	0.0000	0.0001
				3000	0.0	0.0006	0.0016	0.0001	0.0001

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.6	0.0000	0.0000	0.0000	0.0000
				120	3.7	0.0001	0.0002	0.0000	0.0000
				175	2.3	0.0001	0.0002	0.0000	0.0000
				250	2.2	0.0001	0.0003	0.0000	0.0000
				500	5.5	0.0004	0.0012	0.0001	0.0001
				750	0.7	0.0001	0.0003	0.0000	0.0000
				1000	1.2	0.0002	0.0007	0.0000	0.0001
				1500	1.2	0.0003	0.0010	0.0000	0.0001
				2000	0.5	0.0002	0.0006	0.0000	0.0001
				3000	0.9	0.0005	0.0014	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Backup Pumps	50	0.4	0.0000	0.0000	0.0000	0.0000
				120	2.4	0.0001	0.0001	0.0000	0.0000
				175	1.5	0.0001	0.0001	0.0000	0.0000
				250	1.4	0.0001	0.0002	0.0000	0.0000
				500	3.6	0.0003	0.0008	0.0000	0.0001
				750	0.5	0.0001	0.0002	0.0000	0.0000
				1000	0.8	0.0002	0.0005	0.0000	0.0000
				1500	0.8	0.0002	0.0007	0.0000	0.0001
				2000	0.3	0.0001	0.0004	0.0000	0.0000
				3000	0.6	0.0003	0.0009	0.0000	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
		Santa Cruz	Prime Generators	50	0.1	0.0001	0.0001	0.0000	0.0000
				120	0.9	0.0008	0.0019	0.0002	0.0003
				175	0.6	0.0007	0.0019	0.0001	0.0002
				250	0.5	0.0009	0.0027	0.0002	0.0002
				500	1.3	0.0031	0.0098	0.0005	0.0008
				750	0.2	0.0007	0.0021	0.0001	0.0002
				1000	0.3	0.0021	0.0060	0.0003	0.0005
				1500	0.3	0.0029	0.0083	0.0004	0.0007
				2000	0.1	0.0018	0.0051	0.0003	0.0005
				3000	0.2	0.0041	0.0116	0.0006	0.0010
				10000	0.0	0.0003	0.0008	0.0000	0.0001
			Prime Pumps	50	0.1	0.0001	0.0001	0.0000	0.0000
				120	0.6	0.0005	0.0012	0.0001	0.0002
				175	0.4	0.0005	0.0012	0.0001	0.0001
				250	0.4	0.0005	0.0017	0.0001	0.0001
				500	0.9	0.0021	0.0066	0.0004	0.0005
				750	0.1	0.0004	0.0014	0.0001	0.0001
				1000	0.2	0.0014	0.0039	0.0002	0.0003
				1500	0.2	0.0019	0.0054	0.0003	0.0005
				2000	0.1	0.0012	0.0033	0.0002	0.0003
				3000	0.1	0.0026	0.0075	0.0004	0.0007
				10000	0.0	0.0002	0.0005	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	2.6	0.0000	0.0000	0.0000	0.0000
				120	17.1	0.0004	0.0010	0.0001	0.0001
				175	10.6	0.0004	0.0011	0.0001	0.0001
				250	10.3	0.0005	0.0015	0.0001	0.0001
				500	25.4	0.0018	0.0057	0.0003	0.0004
				750	3.4	0.0004	0.0012	0.0001	0.0001
				1000	5.7	0.0011	0.0034	0.0002	0.0003
				1500	5.7	0.0016	0.0048	0.0002	0.0004
				2000	2.5	0.0010	0.0029	0.0001	0.0002
				3000	4.0	0.0022	0.0066	0.0003	0.0005
				10000	0.1	0.0001	0.0004	0.0000	0.0000
			Backup Pumps	50	1.7	0.0000	0.0000	0.0000	0.0000
				120	11.1	0.0003	0.0007	0.0000	0.0001
				175	6.9	0.0002	0.0007	0.0000	0.0001
				250	6.7	0.0003	0.0009	0.0000	0.0001
				500	16.5	0.0012	0.0038	0.0002	0.0003
				750	2.2	0.0002	0.0008	0.0000	0.0001
				1000	3.7	0.0007	0.0022	0.0001	0.00[illegible]
				1500	3.7	0.0010	0.0031	0.0001	0.0[illegible]
				2000	1.6	0.0006	0.0019	0.0001	0.00[illegible]
				3000	2.6	0.0014	0.0043	0.0002	0.0004
				10000	0.1	0.0001	0.0003	0.0000	0.0000
Monterey Bay Unified APCD Total		0	0	0	427.2	0.1275	0.3744	0.0195	0.0328
North Coast Unified APCD	North Coast	Del Norte	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0002	0.0000	0.0000
				175	0.1	0.0001	0.0002	0.0000	0.0000
				250	0.1	0.0001	0.0003	0.0000	0.0000
				500	0.1	0.0003	0.0011	0.0001	0.0001
				750	0.0	0.0001	0.0002	0.0000	0.0000
				1000	0.0	0.0002	0.0006	0.0000	0.0001
				1500	0.0	0.0003	0.0009	0.0000	0.0001
				2000	0.0	0.0002	0.0005	0.0000	0.0000
				3000	0.0	0.0004	0.0012	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0001	0.0000	0.0000
				175	0.0	0.0000	0.0001	0.0000	0.0000
				250	0.0	0.0001	0.0002	0.0000	0.0000
				500	0.1	0.0002	0.0007	0.0000	0.0001
				750	0.0	0.0000	0.0002	0.0000	0.0000
				1000	0.0	0.0001	0.0004	0.0000	0.0000
				1500	0.0	0.0002	0.0006	0.0000	0.0001
				2000	0.0	0.0001	0.0004	0.0000	0.0000
				3000	0.0	0.0003	0.0008	0.0000	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0
				175	0.0	0.0000	0.0000	0.0000	0.0.
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.3	0.0000	0.0000	0.0000	0.0000
				120	1.8	0.0000	0.0001	0.0000	0.0000
				175	1.1	0.0000	0.0001	0.0000	0.0000
				250	1.1	0.0001	0.0002	0.0000	0.0000
				500	2.7	0.0002	0.0006	0.0000	0.0000
				750	0.4	0.0000	0.0001	0.0000	0.0000
				1000	0.6	0.0001	0.0004	0.0000	0.0000
				1500	0.6	0.0002	0.0005	0.0000	0.0000
				2000	0.3	0.0001	0.0003	0.0000	0.0000
				3000	0.4	0.0002	0.0007	0.0000	0.0001
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Pumps	50	0.2	0.0000	0.0000	0.0000	0.0000
				120	1.2	0.0000	0.0001	0.0000	0.0000
				175	0.7	0.0000	0.0001	0.0000	0.0000
				250	0.7	0.0000	0.0001	0.0000	0.0000
				500	1.8	0.0001	0.0004	0.0000	0.0000
				750	0.2	0.0000	0.0001	0.0000	0.0000
				1000	0.4	0.0001	0.0002	0.0000	0.0000
				1500	0.4	0.0001	0.0003	0.0000	0.0000
				2000	0.2	0.0001	0.0002	0.0000	0.0000
				3000	0.3	0.0002	0.0005	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
		Humboldt	Prime Generators	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.4	0.0004	0.0009	0.0001	0.0001
				175	0.3	0.0004	0.0010	0.0001	0.0001
				250	0.3	0.0004	0.0013	0.0001	0.0001
				500	0.7	0.0015	0.0048	0.0003	0.0004
				750	0.1	0.0003	0.0011	0.0001	0.0001
				1000	0.1	0.0010	0.0029	0.0001	0.0003
				1500	0.1	0.0014	0.0041	0.0002	0.0004
				2000	0.1	0.0009	0.0025	0.0001	0.0002
				3000	0.1	0.0020	0.0057	0.0003	0.0005
				10000	0.0	0.0001	0.0004	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.3	0.0002	0.0006	0.0001	0.0001
				175	0.2	0.0002	0.0006	0.0000	0.0001
				250	0.2	0.0003	0.0008	0.0000	0.0001
				500	0.4	0.0010	0.0032	0.0002	0.0003
				750	0.1	0.0002	0.0007	0.0000	0.0001
				1000	0.1	0.0007	0.0019	0.0001	0.0002
				1500	0.1	0.0009	0.0027	0.0001	0.0002
				2000	0.0	0.0006	0.0016	0.0001	0.0001
				3000	0.1	0.0013	0.0037	0.0002	0.0003
				10000	0.0	0.0001	0.0002	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day CO	NOx	PM	ROG
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	1.3	0.0000	0.0000	0.0000	0.0000
				120	8.4	0.0002	0.0005	0.0000	0.0001
				175	5.2	0.0002	0.0005	0.0000	0.0000
				250	5.0	0.0002	0.0007	0.0000	0.0001
				500	12.5	0.0009	0.0028	0.0001	0.0002
				750	1.7	0.0002	0.0006	0.0000	0.0000
				1000	2.8	0.0006	0.0017	0.0001	0.0001
				1500	2.8	0.0008	0.0023	0.0001	0.0002
				2000	1.2	0.0005	0.0014	0.0001	0.0001
				3000	2.0	0.0011	0.0032	0.0002	0.0003
				10000	0.1	0.0001	0.0002	0.0000	0.0000
			Backup Pumps	50	0.8	0.0000	0.0000	0.0000	0.0000
				120	5.5	0.0001	0.0003	0.0000	0.0000
				175	3.4	0.0001	0.0003	0.0000	0.0000
				250	3.3	0.0001	0.0005	0.0000	0.0000
				500	8.1	0.0006	0.0019	0.0001	0.0001
				750	1.1	0.0001	0.0004	0.0000	0.0000
				1000	1.8	0.0004	0.0011	0.0001	0.0001
				1500	1.8	0.0005	0.0015	0.0001	0.0001
				2000	0.8	0.0003	0.0009	0.0000	0.0001
				3000	1.3	0.0007	0.0021	0.0001	0.0002
				10000	0.0	0.0000	0.0001	0.0000	0.0000
		Trinity	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0001	0.0000	0.0
				175	0.0	0.0000	0.0001	0.0000	0.0
				250	0.0	0.0000	0.0001	0.0000	0.0000
				500	0.1	0.0002	0.0005	0.0000	0.0000
				750	0.0	0.0000	0.0001	0.0000	0.0000
				1000	0.0	0.0001	0.0003	0.0000	0.0000
				1500	0.0	0.0001	0.0004	0.0000	0.0000
				2000	0.0	0.0001	0.0003	0.0000	0.0000
				3000	0.0	0.0002	0.0006	0.0000	0.0001
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0001	0.0000	0.0000
				175	0.0	0.0000	0.0001	0.0000	0.0000
				250	0.0	0.0000	0.0001	0.0000	0.0000
				500	0.0	0.0001	0.0003	0.0000	0.0000
				750	0.0	0.0000	0.0001	0.0000	0.0000
				1000	0.0	0.0001	0.0002	0.0000	0.0000
				1500	0.0	0.0001	0.0003	0.0000	0.0000
				2000	0.0	0.0001	0.0002	0.0000	0.0000
				3000	0.0	0.0001	0.0004	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0
				10000	0.0	0.0000	0.0000	0.0000	0.0
			Backup Generators	50	0.1	0.0000	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				120	0.9	0.0000	0.0001	0.0000	0.0000
				175	0.5	0.0000	0.0001	0.0000	0.0000
				250	0.5	0.0000	0.0001	0.0000	0.0000
				500	1.3	0.0001	0.0003	0.0000	0.0000
				750	0.2	0.0000	0.0001	0.0000	0.0000
				1000	0.3	0.0001	0.0002	0.0000	0.0000
				1500	0.3	0.0001	0.0002	0.0000	0.0000
				2000	0.1	0.0000	0.0001	0.0000	0.0000
				3000	0.2	0.0001	0.0003	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Pumps	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.6	0.0000	0.0000	0.0000	0.0000
				175	0.4	0.0000	0.0000	0.0000	0.0000
				250	0.3	0.0000	0.0000	0.0000	0.0000
				500	0.8	0.0001	0.0002	0.0000	0.0000
				750	0.1	0.0000	0.0000	0.0000	0.0000
				1000	0.2	0.0000	0.0001	0.0000	0.0000
				1500	0.2	0.0001	0.0002	0.0000	0.0000
				2000	0.1	0.0000	0.0001	0.0000	0.0000
				3000	0.1	0.0001	0.0002	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
North Coast Unified APCD Total		0	0	0	98.7	0.0289	0.0848	0.0044	0.0074
Northern Sierra AQMD	Mountain Counties	Nevada	Prime Generators	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.3	0.0003	0.0007	0.0001	0.0001
				175	0.2	0.0003	0.0007	0.0000	0.0001
				250	0.2	0.0003	0.0010	0.0001	0.0001
				500	0.5	0.0012	0.0036	0.0002	0.0003
				750	0.1	0.0003	0.0008	0.0000	0.0001
				1000	0.1	0.0008	0.0022	0.0001	0.0002
				1500	0.1	0.0011	0.0031	0.0002	0.0003
				2000	0.0	0.0007	0.0019	0.0001	0.0002
				3000	0.1	0.0015	0.0043	0.0002	0.0004
				10000	0.0	0.0001	0.0003	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.2	0.0002	0.0005	0.0000	0.0001
				175	0.1	0.0002	0.0005	0.0000	0.0000
				250	0.1	0.0002	0.0006	0.0000	0.0001
				500	0.3	0.0008	0.0024	0.0001	0.0002
				750	0.0	0.0002	0.0005	0.0000	0.0000
				1000	0.1	0.0005	0.0014	0.0001	0.0001
				1500	0.1	0.0007	0.0020	0.0001	0.0002
				2000	0.0	0.0004	0.0012	0.0001	0.0001
				3000	0.1	0.0010	0.0028	0.0001	0.0002
				10000	0.0	0.0001	0.0002	0.0000	0.0000
			Other	50	0.0	0.0003	0.0003	0.0000	0.0001
				50	0.8	0.0003	0.0003	0.0000	0.0001
				120	0.0	0.0010	0.0025	0.0003	0.0003
				120	0.8	0.0010	0.0025	0.0003	0.0003
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0024	0.0075	0.0004	0.0006
				500	0.8	0.0024	0.0075	0.0004	0.0006
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day, CO	NOx	PM	ROG
			Backup Generators	50	1.0	0.0000	0.0000	0.0000	0.0000
				120	6.3	0.0001	0.0004	0.0000	0.0000
				175	3.9	0.0001	0.0004	0.0000	0.0000
				250	3.8	0.0002	0.0006	0.0000	0.0000
				500	9.4	0.0006	0.0021	0.0001	0.0002
				750	1.2	0.0001	0.0005	0.0000	0.0000
				1000	2.1	0.0004	0.0013	0.0001	0.0001
				1500	2.1	0.0006	0.0018	0.0001	0.0001
				2000	0.9	0.0004	0.0011	0.0001	0.0001
				3000	1.5	0.0008	0.0024	0.0001	0.0002
				10000	0.1	0.0001	0.0002	0.0000	0.0000
			Backup Pumps	50	0.6	0.0000	0.0000	0.0000	0.0000
				120	4.1	0.0001	0.0002	0.0000	0.0000
				175	2.6	0.0001	0.0003	0.0000	0.0000
				250	2.5	0.0001	0.0003	0.0000	0.0000
				500	6.1	0.0004	0.0014	0.0001	0.0001
				750	0.8	0.0001	0.0003	0.0000	0.0000
				1000	1.4	0.0003	0.0008	0.0000	0.0001
				1500	1.4	0.0004	0.0011	0.0001	0.0001
				2000	0.6	0.0002	0.0007	0.0000	0.0001
				3000	1.0	0.0005	0.0016	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
		Plumas	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0002	0.0000	0.0000
				175	0.0	0.0001	0.0002	0.0000	0.0000
				250	0.0	0.0001	0.0002	0.0000	0.0
				500	0.1	0.0003	0.0008	0.0000	0.000
				750	0.0	0.0001	0.0002	0.0000	0.0000
				1000	0.0	0.0002	0.0005	0.0000	0.0000
				1500	0.0	0.0002	0.0007	0.0000	0.0001
				2000	0.0	0.0001	0.0004	0.0000	0.0000
				3000	0.0	0.0003	0.0009	0.0000	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0001	0.0000	0.0000
				175	0.0	0.0000	0.0001	0.0000	0.0000
				250	0.0	0.0000	0.0001	0.0000	0.0000
				500	0.1	0.0002	0.0005	0.0000	0.0000
				750	0.0	0.0000	0.0001	0.0000	0.0000
				1000	0.0	0.0001	0.0003	0.0000	0.0000
				1500	0.0	0.0002	0.0004	0.0000	0.0000
				2000	0.0	0.0001	0.0003	0.0000	0.0000
				3000	0.0	0.0002	0.0006	0.0000	0.0001
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Other	50	0.0	0.0001	0.0001	0.0000	0.0000
				50	0.2	0.0001	0.0001	0.0000	0.0000
				120	0.0	0.0002	0.0005	0.0001	0.0001
				120	0.2	0.0002	0.0005	0.0001	0.0001
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0005	0.0017	0.0001	0.0001
				500	0.2	0.0005	0.0017	0.0001	0.0001
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0
				3000	0.0	0.0000	0.0000	0.0000	0.0
				10000	0.0	0.0000	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
			Backup Generators	50	0.2	0.0000	0.0000	0.0000	0.0000
				120	1.4	0.0000	0.0001	0.0000	0.0000
				175	0.9	0.0000	0.0001	0.0000	0.0000
				250	0.8	0.0000	0.0001	0.0000	0.0000
				500	2.1	0.0001	0.0005	0.0000	0.0000
				750	0.3	0.0000	0.0001	0.0000	0.0000
				1000	0.5	0.0001	0.0003	0.0000	0.0000
				1500	0.5	0.0001	0.0004	0.0000	0.0000
				2000	0.2	0.0001	0.0002	0.0000	0.0000
				3000	0.3	0.0002	0.0005	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Pumps	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.9	0.0000	0.0001	0.0000	0.0000
				175	0.6	0.0000	0.0001	0.0000	0.0000
				250	0.5	0.0000	0.0001	0.0000	0.0000
				500	1.3	0.0001	0.0003	0.0000	0.0000
				750	0.2	0.0000	0.0001	0.0000	0.0000
				1000	0.3	0.0001	0.0002	0.0000	0.0000
				1500	0.3	0.0001	0.0003	0.0000	0.0000
				2000	0.1	0.0001	0.0002	0.0000	0.0000
				3000	0.2	0.0001	0.0003	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
		Sierra	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0001	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0001	0.0000	0.0000
				1500	0.0	0.0000	0.0001	0.0000	0.0000
				2000	0.0	0.0000	0.0001	0.0000	0.0000
				3000	0.0	0.0001	0.0002	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0001	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0001	0.0000	0.0000
				1500	0.0	0.0000	0.0001	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0001	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0001	0.0000	0.0000
				120	0.0	0.0000	0.0001	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0001	0.0003	0.0000	0.0000
				500	0.0	0.0001	0.0003	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
			Backup Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.2	0.0000	0.0000	0.0000	0.0000
				175	0.1	0.0000	0.0000	0.0000	0.0000
				250	0.1	0.0000	0.0000	0.0000	0.0000
				500	0.3	0.0000	0.0001	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.1	0.0000	0.0000	0.0000	0.0000
				1500	0.1	0.0000	0.0001	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.1	0.0000	0.0001	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.2	0.0000	0.0000	0.0000	0.0000
				175	0.1	0.0000	0.0000	0.0000	0.0000
				250	0.1	0.0000	0.0000	0.0000	0.0000
				500	0.2	0.0000	0.0001	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.1	0.0000	0.0000	0.0000	0.0000
				1500	0.1	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0001	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
Northern Sierra AQMD Total		0	0	0	73.4	0.0299	0.0863	0.0049	0.0080
Northern Sonoma County APCD	North Coast	Sonoma	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.2	0.0002	0.0004	0.0000	0.0
				175	0.1	0.0002	0.0004	0.0000	0.0000
				250	0.1	0.0002	0.0006	0.0000	0.0001
				500	0.3	0.0007	0.0022	0.0001	0.0002
				750	0.0	0.0002	0.0005	0.0000	0.0000
				1000	0.1	0.0005	0.0013	0.0001	0.0001
				1500	0.1	0.0007	0.0019	0.0001	0.0002
				2000	0.0	0.0004	0.0011	0.0001	0.0001
				3000	0.0	0.0009	0.0026	0.0001	0.0002
				10000	0.0	0.0001	0.0002	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0003	0.0000	0.0000
				175	0.1	0.0001	0.0003	0.0000	0.0000
				250	0.1	0.0001	0.0004	0.0000	0.0000
				500	0.2	0.0005	0.0015	0.0001	0.0001
				750	0.0	0.0001	0.0003	0.0000	0.0000
				1000	0.0	0.0003	0.0009	0.0000	0.0001
				1500	0.0	0.0004	0.0012	0.0001	0.0001
				2000	0.0	0.0003	0.0007	0.0000	0.0001
				3000	0.0	0.0006	0.0017	0.0001	0.0002
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0
				10000	0.0	0.0000	0.0000	0.0000	0.0
			Backup Generators	50	0.6	0.0000	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				120	3.8	0.0001	0.0002	0.0000	0.0000
				175	2.4	0.0001	0.0002	0.0000	0.0000
				250	2.3	0.0001	0.0003	0.0000	0.0000
				500	5.7	0.0004	0.0013	0.0001	0.0001
				750	0.8	0.0001	0.0003	0.0000	0.0000
				1000	1.3	0.0003	0.0008	0.0000	0.0001
				1500	1.3	0.0004	0.0011	0.0001	0.0001
				2000	0.6	0.0002	0.0006	0.0000	0.0001
				3000	0.9	0.0005	0.0015	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Backup Pumps	50	0.4	0.0000	0.0000	0.0000	0.0000
				120	2.5	0.0001	0.0001	0.0000	0.0000
				175	1.6	0.0001	0.0002	0.0000	0.0000
				250	1.5	0.0001	0.0002	0.0000	0.0000
				500	3.7	0.0003	0.0009	0.0000	0.0001
				750	0.5	0.0001	0.0002	0.0000	0.0000
				1000	0.8	0.0002	0.0005	0.0000	0.0000
				1500	0.8	0.0002	0.0007	0.0000	0.0001
				2000	0.4	0.0001	0.0004	0.0000	0.0000
				3000	0.6	0.0003	0.0010	0.0000	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
Northern Sonoma County APCD Total		0	0	0	34.1	0.0100	0.0293	0.0015	0.0026
Placer County APCD	Lake Tahoe	Placer	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0001	0.0000	0.0000
				175	0.0	0.0000	0.0001	0.0000	0.0000
				250	0.0	0.0000	0.0001	0.0000	0.0000
				500	0.1	0.0002	0.0005	0.0000	0.0000
				750	0.0	0.0000	0.0001	0.0000	0.0000
				1000	0.0	0.0001	0.0003	0.0000	0.0000
				1500	0.0	0.0001	0.0004	0.0000	0.0000
				2000	0.0	0.0001	0.0003	0.0000	0.0000
				3000	0.0	0.0002	0.0006	0.0000	0.0001
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0001	0.0000	0.0000
				175	0.0	0.0000	0.0001	0.0000	0.0000
				250	0.0	0.0000	0.0001	0.0000	0.0000
				500	0.0	0.0001	0.0003	0.0000	0.0000
				750	0.0	0.0000	0.0001	0.0000	0.0000
				1000	0.0	0.0001	0.0002	0.0000	0.0000
				1500	0.0	0.0001	0.0003	0.0000	0.0000
				2000	0.0	0.0001	0.0002	0.0000	0.0000
				3000	0.0	0.0001	0.0004	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.9	0.0000	0.0001	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/da CO	NOx	PM	ROG
				175	0.5	0.0000	0.0001	0.0000	0.0000
				250	0.5	0.0000	0.0001	0.0000	0.0000
				500	1.3	0.0001	0.0003	0.0000	0.0000
				750	0.2	0.0000	0.0001	0.0000	0.0000
				1000	0.3	0.0001	0.0002	0.0000	0.0000
				1500	0.3	0.0001	0.0002	0.0000	0.0000
				2000	0.1	0.0000	0.0001	0.0000	0.0000
				3000	0.2	0.0001	0.0003	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Pumps	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.6	0.0000	0.0000	0.0000	0.0000
				175	0.4	0.0000	0.0000	0.0000	0.0000
				250	0.3	0.0000	0.0000	0.0000	0.0000
				500	0.8	0.0001	0.0002	0.0000	0.0000
				750	0.1	0.0000	0.0000	0.0000	0.0000
				1000	0.2	0.0000	0.0001	0.0000	0.0000
				1500	0.2	0.0001	0.0002	0.0000	0.0000
				2000	0.1	0.0000	0.0001	0.0000	0.0000
				3000	0.1	0.0001	0.0002	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
	Mountain Counties		Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0002	0.0000	0.0000
				175	0.1	0.0001	0.0002	0.0000	0.0000
				250	0.1	0.0001	0.0003	0.0000	0.0000
				500	0.1	0.0003	0.0009	0.0000	0.0001
				750	0.0	0.0001	0.0002	0.0000	0.0000
				1000	0.0	0.0002	0.0006	0.0000	0
				1500	0.0	0.0003	0.0008	0.0000	0.0
				2000	0.0	0.0002	0.0005	0.0000	0.0000
				3000	0.0	0.0004	0.0011	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0000	0.0001	0.0000	0.0000
				175	0.0	0.0000	0.0001	0.0000	0.0000
				250	0.0	0.0001	0.0002	0.0000	0.0000
				500	0.1	0.0002	0.0006	0.0000	0.0001
				750	0.0	0.0000	0.0001	0.0000	0.0000
				1000	0.0	0.0001	0.0004	0.0000	0.0000
				1500	0.0	0.0002	0.0005	0.0000	0.0000
				2000	0.0	0.0001	0.0003	0.0000	0.0000
				3000	0.0	0.0002	0.0007	0.0000	0.0001
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.1	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.2	0.0000	0.0000	0.0000	0.0000
				120	1.6	0.0000	0.0001	0.0000	0
				175	1.0	0.0000	0.0001	0.0000	0
				250	1.0	0.0000	0.0001	0.0000	0.0000
				500	2.4	0.0002	0.0005	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				750	0.3	0.0000	0.0001	0.0000	0.0000
				1000	0.5	0.0001	0.0003	0.0000	0.0000
				1500	0.5	0.0001	0.0004	0.0000	0.0000
				2000	0.2	0.0001	0.0003	0.0000	0.0000
				3000	0.4	0.0002	0.0006	0.0000	0.0001
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Pumps	50	0.2	0.0000	0.0000	0.0000	0.0000
				120	1.0	0.0000	0.0001	0.0000	0.0000
				175	0.6	0.0000	0.0001	0.0000	0.0000
				250	0.6	0.0000	0.0001	0.0000	0.0000
				500	1.5	0.0001	0.0004	0.0000	0.0000
				750	0.2	0.0000	0.0001	0.0000	0.0000
				1000	0.3	0.0001	0.0002	0.0000	0.0000
				1500	0.3	0.0001	0.0003	0.0000	0.0000
				2000	0.2	0.0001	0.0002	0.0000	0.0000
				3000	0.2	0.0001	0.0004	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
	Sacramento Valley		Prime Generators	50	0.1	0.0001	0.0001	0.0000	0.0000
				120	0.8	0.0007	0.0017	0.0002	0.0002
				175	0.5	0.0006	0.0017	0.0001	0.0002
				250	0.5	0.0008	0.0024	0.0001	0.0002
				500	1.2	0.0028	0.0089	0.0005	0.0007
				750	0.2	0.0006	0.0019	0.0001	0.0002
				1000	0.3	0.0019	0.0054	0.0003	0.0005
				1500	0.3	0.0026	0.0075	0.0004	0.0007
				2000	0.1	0.0016	0.0046	0.0002	0.0004
				3000	0.2	0.0037	0.0104	0.0005	0.0009
				10000	0.0	0.0002	0.0007	0.0000	0.0001
			Prime Pumps	50	0.1	0.0001	0.0000	0.0000	0.0000
				120	0.5	0.0005	0.0011	0.0001	0.0001
				175	0.3	0.0004	0.0011	0.0001	0.0001
				250	0.3	0.0005	0.0015	0.0001	0.0001
				500	0.8	0.0019	0.0059	0.0003	0.0005
				750	0.1	0.0004	0.0013	0.0001	0.0001
				1000	0.2	0.0012	0.0035	0.0002	0.0003
				1500	0.2	0.0017	0.0049	0.0002	0.0004
				2000	0.1	0.0010	0.0030	0.0001	0.0003
				3000	0.1	0.0024	0.0068	0.0003	0.0006
				10000	0.0	0.0002	0.0005	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0001	0.0000	0.0000
				500	0.9	0.0000	0.0001	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	2.4	0.0000	0.0000	0.0000	0.0000
				120	15.4	0.0004	0.0009	0.0001	0.0001
				175	9.6	0.0003	0.0010	0.0000	0.0001
				250	9.2	0.0004	0.0013	0.0001	0.0001
				500	22.9	0.0016	0.0051	0.0002	0.0004
				750	3.0	0.0003	0.0011	0.0001	0.0001
				1000	5.1	0.0010	0.0031	0.0001	0.0003
				1500	5.1	0.0014	0.0043	0.0002	0.0003

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day, CO	NOx	PM	ROG
				2000	2.2	0.0009	0.0026	0.0001	0.0002
				3000	3.6	0.0020	0.0059	0.0003	0.0005
				10000	0.1	0.0001	0.0004	0.0000	0.0000
			Backup Pumps	50	1.5	0.0000	0.0000	0.0000	0.0000
				120	10.0	0.0002	0.0006	0.0000	0.0001
				175	6.2	0.0002	0.0006	0.0000	0.0001
				250	6.0	0.0003	0.0008	0.0000	0.0001
				500	14.9	0.0011	0.0034	0.0002	0.0003
				750	2.0	0.0002	0.0007	0.0000	0.0001
				1000	3.3	0.0007	0.0020	0.0001	0.0002
				1500	3.3	0.0009	0.0028	0.0001	0.0002
				2000	1.5	0.0006	0.0017	0.0001	0.0001
				3000	2.4	0.0013	0.0039	0.0002	0.0003
				10000	0.1	0.0001	0.0003	0.0000	0.0000
Placer County APCD Total	0	0	0		159.7	0.0466	0.1365	0.0071	0.0120
Sacramento Metropolitan AQMD	Sacramento Valley	Sacramento	Prime Generators	50	0.7	0.0004	0.0004	0.0001	0.0002
				120	4.5	0.0039	0.0096	0.0009	0.0013
				175	2.8	0.0036	0.0097	0.0006	0.0010
				250	2.7	0.0044	0.0135	0.0008	0.0012
				500	6.7	0.0156	0.0492	0.0027	0.0041
				750	0.9	0.0034	0.0108	0.0006	0.0009
				1000	1.5	0.0105	0.0300	0.0015	0.0027
				1500	1.5	0.0147	0.0418	0.0021	0.0037
				2000	0.7	0.0089	0.0253	0.0013	0.0023
				3000	1.1	0.0204	0.0580	0.0029	0.0052
				10000	0.0	0.0014	0.0039	0.0002	0.00[illegible]
			Prime Pumps	50	0.5	0.0003	0.0003	0.0000	0.0[illegible]
				120	2.9	0.0025	0.0062	0.0006	0.00[illegible]
				175	1.8	0.0023	0.0062	0.0004	0.0006
				250	1.8	0.0027	0.0084	0.0005	0.0007
				500	4.4	0.0104	0.0328	0.0018	0.0028
				750	0.6	0.0022	0.0070	0.0004	0.0006
				1000	1.0	0.0069	0.0195	0.0010	0.0017
				1500	1.0	0.0096	0.0272	0.0014	0.0024
				2000	0.4	0.0058	0.0165	0.0008	0.0015
				3000	0.7	0.0133	0.0377	0.0019	0.0034
				10000	0.0	0.0009	0.0025	0.0001	0.0002
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0004	0.0010	0.0001	0.0001
				120	1.0	0.0004	0.0010	0.0001	0.0001
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0020	0.0063	0.0004	0.0005
				500	1.0	0.0020	0.0063	0.0004	0.0005
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	13.2	0.0001	0.0002	0.0000	0.0001
				120	85.4	0.0020	0.0051	0.0004	0.0006
				175	53.3	0.0019	0.0053	0.0003	0.0005
				250	51.4	0.0024	0.0075	0.0004	0.0006
				500	127.2	0.0088	0.0285	0.0013	0.0022
				750	16.9	0.0019	0.0062	0.0003	0.0[illegible]
				1000	28.5	0.0058	0.0171	0.0008	0.0[illegible]
				1500	28.6	0.0080	0.0238	0.0011	0.0019
				2000	12.4	0.0049	0.0144	0.0007	0.0012

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				3000	20.1	0.0111	0.0330	0.0016	0.0027
				10000	0.7	0.0007	0.0022	0.0001	0.0002
			Backup Pumps	50	8.6	0.0001	0.0001	0.0000	0.0000
				120	55.6	0.0013	0.0033	0.0002	0.0004
				175	34.7	0.0012	0.0034	0.0002	0.0003
				250	33.4	0.0015	0.0046	0.0002	0.0004
				500	82.8	0.0059	0.0190	0.0009	0.0015
				750	11.0	0.0013	0.0040	0.0002	0.0003
				1000	18.6	0.0037	0.0111	0.0005	0.0009
				1500	18.6	0.0052	0.0155	0.0007	0.0013
				2000	8.1	0.0032	0.0094	0.0004	0.0008
				3000	13.1	0.0072	0.0215	0.0010	0.0018
				10000	0.5	0.0005	0.0014	0.0001	0.0001
Sacramento Metropolitan AQMD Total		0	0	0	762.7	0.2276	0.6676	0.0349	0.0586
San Diego County APCD	San Diego	San Diego	Prime Generators	50	1.6	0.0010	0.0008	0.0001	0.0004
				120	10.2	0.0087	0.0216	0.0021	0.0029
				175	6.3	0.0081	0.0219	0.0014	0.0022
				250	6.1	0.0100	0.0306	0.0018	0.0027
				500	15.1	0.0353	0.1113	0.0060	0.0093
				750	2.0	0.0077	0.0243	0.0013	0.0021
				1000	3.4	0.0238	0.0678	0.0034	0.0061
				1500	3.4	0.0332	0.0945	0.0048	0.0085
				2000	1.5	0.0201	0.0572	0.0029	0.0051
				3000	2.4	0.0461	0.1312	0.0066	0.0118
				10000	0.1	0.0031	0.0088	0.0004	0.0008
			Prime Pumps	50	1.0	0.0007	0.0006	0.0001	0.0003
				120	6.6	0.0057	0.0141	0.0014	0.0019
				175	4.1	0.0052	0.0141	0.0009	0.0014
				250	4.0	0.0062	0.0189	0.0011	0.0017
				500	9.9	0.0236	0.0742	0.0040	0.0062
				750	1.3	0.0050	0.0158	0.0009	0.0013
				1000	2.2	0.0155	0.0441	0.0022	0.0040
				1500	2.2	0.0216	0.0615	0.0031	0.0055
				2000	1.0	0.0131	0.0373	0.0019	0.0033
				3000	1.6	0.0300	0.0854	0.0043	0.0077
				10000	0.1	0.0020	0.0057	0.0003	0.0005
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0020	0.0050	0.0005	0.0007
				120	1.0	0.0020	0.0050	0.0005	0.0007
				120	4.0	0.0020	0.0050	0.0005	0.0007
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0066	0.0208	0.0011	0.0017
				500	1.0	0.0066	0.0208	0.0011	0.0017
				500	4.0	0.0066	0.0208	0.0011	0.0017
				750	0.0	0.0036	0.0114	0.0006	0.0010
				750	1.0	0.0036	0.0114	0.0006	0.0010
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	29.8	0.0003	0.0004	0.0001	0.0001
				120	193.2	0.0045	0.0115	0.0008	0.0013
				175	120.5	0.0043	0.0120	0.0006	0.0011
				250	116.2	0.0054	0.0169	0.0008	0.0014
				500	287.8	0.0199	0.0645	0.0029	0.0050
				750	38.2	0.0044	0.0141	0.0006	0.0011

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				1000	64.6	0.0130	0.0386	0.0019	0.0032
				1500	64.7	0.0181	0.0539	0.0026	0.0044
				2000	28.1	0.0110	0.0326	0.0016	0.0027
				3000	45.5	0.0252	0.0747	0.0036	0.0061
				10000	1.6	0.0017	0.0050	0.0002	0.0004
			Backup Pumps	50	19.4	0.0002	0.0003	0.0000	0.0001
				120	125.7	0.0029	0.0075	0.0006	0.0009
				175	78.4	0.0027	0.0077	0.0004	0.0007
				250	75.6	0.0033	0.0104	0.0005	0.0008
				500	187.3	0.0133	0.0430	0.0019	0.0033
				750	24.9	0.0028	0.0091	0.0004	0.0007
				1000	42.0	0.0085	0.0251	0.0012	0.0021
				1500	42.1	0.0118	0.0350	0.0017	0.0029
				2000	18.3	0.0072	0.0212	0.0010	0.0017
				3000	29.6	0.0164	0.0486	0.0023	0.0040
				10000	1.0	0.0011	0.0032	0.0002	0.0003
San Diego County APCD Total		0	0	0	1731.6	0.5371	1.5774	0.0830	0.1388
San Joaquin Valley Unified APCD	San Joaquin Valley	Fresno	Prime Generators	50	0.4	0.0003	0.0002	0.0000	0.0001
				120	2.9	0.0025	0.0062	0.0006	0.0008
				175	1.8	0.0023	0.0062	0.0004	0.0006
				250	1.7	0.0028	0.0087	0.0005	0.0008
				500	4.3	0.0101	0.0317	0.0017	0.0027
				750	0.6	0.0022	0.0069	0.0004	0.0006
				1000	1.0	0.0068	0.0193	0.0010	0.0017
				1500	1.0	0.0095	0.0269	0.0014	0.00[illegible]
				2000	0.4	0.0057	0.0163	0.0008	0.0[illegible]
				3000	0.7	0.0131	0.0373	0.0019	0.0[illegible]
				10000	0.0	0.0009	0.0025	0.0001	0.0002
			Prime Pumps	50	0.3	0.0002	0.0002	0.0000	0.0001
				120	1.9	0.0016	0.0040	0.0004	0.0005
				175	1.2	0.0015	0.0040	0.0003	0.0004
				250	1.1	0.0018	0.0054	0.0003	0.0005
				500	2.8	0.0067	0.0211	0.0011	0.0018
				750	0.4	0.0014	0.0045	0.0002	0.0004
				1000	0.6	0.0044	0.0126	0.0006	0.0011
				1500	0.6	0.0062	0.0175	0.0009	0.0016
				2000	0.3	0.0037	0.0106	0.0005	0.0010
				3000	0.4	0.0085	0.0243	0.0012	0.0022
				10000	0.0	0.0006	0.0016	0.0001	0.0001
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0012	0.0030	0.0003	0.0004
				120	0.5	0.0012	0.0030	0.0003	0.0004
				120	2.0	0.0012	0.0030	0.0003	0.0004
				175	0.0	0.0011	0.0030	0.0002	0.0003
				175	0.5	0.0011	0.0030	0.0002	0.0003
				175	1.2	0.0011	0.0030	0.0002	0.0003
				250	0.0	0.0004	0.0013	0.0001	0.0001
				250	0.2	0.0004	0.0013	0.0001	0.0001
				500	0.0	0.0060	0.0187	0.0010	0.0016
				500	1.7	0.0060	0.0187	0.0010	0.0016
				500	2.2	0.0060	0.0187	0.0010	0.0016
				750	0.0	0.0013	0.0041	0.0002	0.0004
				750	0.2	0.0013	0.0041	0.0002	0.0004
				1000	0.0	0.0014	0.0040	0.0002	0.0003
				1000	0.5	0.0014	0.0040	0.0002	0.0003
				1500	0.0	0.0000	0.0000	0.0000	0.0
				2000	0.0	0.0000	0.0000	0.0000	0.0
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
			Backup Generators	50	8.5	0.0001	0.0001	0.0000	0.0000
				120	55.0	0.0013	0.0033	0.0002	0.0004
				175	34.3	0.0012	0.0034	0.0002	0.0003
				250	33.1	0.0015	0.0048	0.0002	0.0004
				500	81.9	0.0057	0.0184	0.0008	0.0014
				750	10.9	0.0012	0.0040	0.0002	0.0003
				1000	18.4	0.0037	0.0110	0.0005	0.0009
				1500	18.4	0.0052	0.0153	0.0007	0.0013
				2000	8.0	0.0031	0.0093	0.0004	0.0008
				3000	12.9	0.0072	0.0213	0.0010	0.0017
				10000	0.4	0.0005	0.0014	0.0001	0.0001
			Backup Pumps	50	5.5	0.0001	0.0001	0.0000	0.0000
				120	35.8	0.0008	0.0021	0.0002	0.0002
				175	22.3	0.0008	0.0022	0.0001	0.0002
				250	21.5	0.0009	0.0030	0.0001	0.0002
				500	53.3	0.0038	0.0122	0.0005	0.0009
				750	7.1	0.0008	0.0026	0.0001	0.0002
				1000	12.0	0.0024	0.0072	0.0003	0.0006
				1500	12.0	0.0034	0.0100	0.0005	0.0008
				2000	5.2	0.0020	0.0060	0.0003	0.0005
				3000	8.4	0.0047	0.0138	0.0007	0.0011
				10000	0.3	0.0003	0.0009	0.0000	0.0001
		Kern	Prime Generators	50	0.3	0.0002	0.0002	0.0000	0.0001
				120	2.0	0.0017	0.0043	0.0004	0.0006
				175	1.3	0.0016	0.0043	0.0003	0.0004
				250	1.2	0.0020	0.0060	0.0004	0.0005
				500	3.0	0.0070	0.0220	0.0012	0.0018
				750	0.4	0.0015	0.0048	0.0003	0.0004
				1000	0.7	0.0047	0.0134	0.0007	0.0012
				1500	0.7	0.0066	0.0186	0.0009	0.0017
				2000	0.3	0.0040	0.0113	0.0006	0.0010
				3000	0.5	0.0091	0.0259	0.0013	0.0023
				10000	0.0	0.0006	0.0017	0.0001	0.0002
			Prime Pumps	50	0.2	0.0001	0.0001	0.0000	0.0001
				120	1.3	0.0011	0.0028	0.0003	0.0004
				175	0.8	0.0010	0.0028	0.0002	0.0003
				250	0.8	0.0012	0.0037	0.0002	0.0003
				500	1.9	0.0046	0.0146	0.0008	0.0012
				750	0.3	0.0010	0.0031	0.0002	0.0003
				1000	0.4	0.0031	0.0087	0.0004	0.0008
				1500	0.4	0.0043	0.0121	0.0006	0.0011
				2000	0.2	0.0026	0.0073	0.0004	0.0007
				3000	0.3	0.0059	0.0168	0.0008	0.0015
				10000	0.0	0.0004	0.0011	0.0001	0.0001
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0008	0.0021	0.0002	0.0003
				120	0.3	0.0008	0.0021	0.0002	0.0003
				120	1.4	0.0008	0.0021	0.0002	0.0003
				175	0.0	0.0008	0.0021	0.0001	0.0002
				175	0.3	0.0008	0.0021	0.0001	0.0002
				175	0.9	0.0008	0.0021	0.0001	0.0002
				250	0.0	0.0003	0.0009	0.0001	0.0001
				250	0.2	0.0003	0.0009	0.0001	0.0001
				500	0.0	0.0055	0.0172	0.0009	0.0015
				500	1.0	0.0055	0.0172	0.0009	0.0015
				500	1.2	0.0055	0.0172	0.0009	0.0015
				500	1.5	0.0055	0.0172	0.0009	0.0015
				750	0.0	0.0009	0.0029	0.0002	0.0002
				750	0.2	0.0009	0.0029	0.0002	0.0002

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day CO	NOx	PM	ROG
				1000	0.0	0.0010	0.0027	0.0001	0.0002
				1000	0.3	0.0010	0.0027	0.0001	0.0002
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	5.9	0.0001	0.0001	0.0000	0.0000
				120	38.1	0.0009	0.0023	0.0002	0.0003
				175	23.8	0.0008	0.0024	0.0001	0.0002
				250	22.9	0.0011	0.0033	0.0002	0.0003
				500	56.8	0.0039	0.0127	0.0006	0.0010
				750	7.5	0.0009	0.0028	0.0001	0.0002
				1000	12.7	0.0026	0.0076	0.0004	0.0006
				1500	12.8	0.0036	0.0106	0.0005	0.0009
				2000	5.5	0.0022	0.0064	0.0003	0.0005
				3000	9.0	0.0050	0.0147	0.0007	0.0012
				10000	0.3	0.0003	0.0010	0.0000	0.0001
			Backup Pumps	50	3.8	0.0000	0.0001	0.0000	0.0000
				120	24.8	0.0006	0.0015	0.0001	0.0002
				175	15.5	0.0005	0.0015	0.0001	0.0001
				250	14.9	0.0007	0.0021	0.0001	0.0002
				500	36.9	0.0026	0.0085	0.0004	0.0007
				750	4.9	0.0006	0.0018	0.0001	0.0001
				1000	8.3	0.0017	0.0050	0.0002	0.0004
				1500	8.3	0.0023	0.0069	0.0003	0.0006
				2000	3.6	0.0014	0.0042	0.0002	0.000[illegible]
				3000	5.8	0.0032	0.0096	0.0005	0.0[illegible]
				10000	0.2	0.0002	0.0006	0.0000	0.00[illegible]
		Kings	Prime Generators	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.5	0.0004	0.0010	0.0001	0.0001
				175	0.3	0.0004	0.0010	0.0001	0.0001
				250	0.3	0.0005	0.0014	0.0001	0.0001
				500	0.7	0.0016	0.0051	0.0003	0.0004
				750	0.1	0.0004	0.0011	0.0001	0.0001
				1000	0.2	0.0011	0.0031	0.0002	0.0003
				1500	0.2	0.0015	0.0043	0.0002	0.0004
				2000	0.1	0.0009	0.0026	0.0001	0.0002
				3000	0.1	0.0021	0.0060	0.0003	0.0005
				10000	0.0	0.0001	0.0004	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.3	0.0003	0.0006	0.0001	0.0001
				175	0.2	0.0002	0.0006	0.0000	0.0001
				250	0.2	0.0003	0.0009	0.0001	0.0001
				500	0.5	0.0011	0.0034	0.0002	0.0003
				750	0.1	0.0002	0.0007	0.0000	0.0001
				1000	0.1	0.0007	0.0020	0.0001	0.0002
				1500	0.1	0.0010	0.0028	0.0001	0.0003
				2000	0.0	0.0006	0.0017	0.0001	0.0002
				3000	0.1	0.0014	0.0039	0.0002	0.0004
				10000	0.0	0.0001	0.0003	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0002	0.0005	0.0000	0.0001
				120	0.1	0.0002	0.0005	0.0000	0.0001
				120	0.3	0.0002	0.0005	0.0000	0.0001
				175	0.0	0.0002	0.0005	0.0000	0.0000
				175	0.1	0.0002	0.0005	0.0000	0.0[illegible]
				175	0.2	0.0002	0.0005	0.0000	0.0[illegible]
				250	0.0	0.0001	0.0002	0.0000	0.0000
				250	0.0	0.0001	0.0002	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				500	0.0	0.0010	0.0030	0.0002	0.0003
				500	0.3	0.0010	0.0030	0.0002	0.0003
				500	0.4	0.0010	0.0030	0.0002	0.0003
				750	0.0	0.0002	0.0007	0.0000	0.0001
				750	0.0	0.0002	0.0007	0.0000	0.0001
				1000	0.0	0.0002	0.0006	0.0000	0.0001
				1000	0.1	0.0002	0.0006	0.0000	0.0001
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	1.4	0.0000	0.0000	0.0000	0.0000
				120	8.9	0.0002	0.0005	0.0000	0.0001
				175	5.5	0.0002	0.0006	0.0000	0.0000
				250	5.3	0.0002	0.0008	0.0000	0.0001
				500	13.2	0.0009	0.0030	0.0001	0.0002
				750	1.8	0.0002	0.0006	0.0000	0.0001
				1000	3.0	0.0006	0.0018	0.0001	0.0001
				1500	3.0	0.0008	0.0025	0.0001	0.0002
				2000	1.3	0.0005	0.0015	0.0001	0.0001
				3000	2.1	0.0012	0.0034	0.0002	0.0003
				10000	0.1	0.0001	0.0002	0.0000	0.0000
			Backup Pumps	50	0.9	0.0000	0.0000	0.0000	0.0000
				120	5.8	0.0001	0.0003	0.0000	0.0000
				175	3.6	0.0001	0.0004	0.0000	0.0000
				250	3.5	0.0002	0.0005	0.0000	0.0000
				500	8.6	0.0006	0.0020	0.0001	0.0002
				750	1.1	0.0001	0.0004	0.0000	0.0000
				1000	1.9	0.0004	0.0012	0.0001	0.0001
				1500	1.9	0.0005	0.0016	0.0001	0.0001
				2000	0.8	0.0003	0.0010	0.0000	0.0001
				3000	1.4	0.0008	0.0022	0.0001	0.0002
				10000	0.0	0.0001	0.0001	0.0000	0.0000
		Madera	Prime Generators	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.5	0.0004	0.0010	0.0001	0.0001
				175	0.3	0.0004	0.0010	0.0001	0.0001
				250	0.3	0.0004	0.0014	0.0001	0.0001
				500	0.7	0.0016	0.0050	0.0003	0.0004
				750	0.1	0.0003	0.0011	0.0001	0.0001
				1000	0.2	0.0011	0.0030	0.0002	0.0003
				1500	0.2	0.0015	0.0042	0.0002	0.0004
				2000	0.1	0.0009	0.0026	0.0001	0.0002
				3000	0.1	0.0021	0.0059	0.0003	0.0005
				10000	0.0	0.0001	0.0004	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.3	0.0003	0.0006	0.0001	0.0001
				175	0.2	0.0002	0.0006	0.0000	0.0001
				250	0.2	0.0003	0.0008	0.0000	0.0001
				500	0.4	0.0011	0.0033	0.0002	0.0003
				750	0.1	0.0002	0.0007	0.0000	0.0001
				1000	0.1	0.0007	0.0020	0.0001	0.0002
				1500	0.1	0.0010	0.0028	0.0001	0.0002
				2000	0.0	0.0006	0.0017	0.0001	0.0002
				3000	0.1	0.0013	0.0038	0.0002	0.0003
				10000	0.0	0.0001	0.0003	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0002	0.0005	0.0000	0.0001
				120	0.1	0.0002	0.0005	0.0000	0.0001
				120	0.3	0.0002	0.0005	0.0000	0.0001

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				175	0.0	0.0002	0.0005	0.0000	0.0000
				175	0.1	0.0002	0.0005	0.0000	0.0000
				175	0.2	0.0002	0.0005	0.0000	0.0000
				250	0.0	0.0001	0.0002	0.0000	0.0000
				250	0.0	0.0001	0.0002	0.0000	0.0000
				500	0.0	0.0009	0.0030	0.0002	0.0003
				500	0.3	0.0009	0.0030	0.0002	0.0003
				500	0.4	0.0009	0.0030	0.0002	0.0003
				750	0.0	0.0002	0.0007	0.0000	0.0001
				750	0.0	0.0002	0.0007	0.0000	0.0001
				1000	0.0	0.0002	0.0006	0.0000	0.0001
				1000	0.1	0.0002	0.0006	0.0000	0.0001
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	1.3	0.0000	0.0000	0.0000	0.0000
				120	8.7	0.0002	0.0005	0.0000	0.0001
				175	5.4	0.0002	0.0005	0.0000	0.0000
				250	5.2	0.0002	0.0008	0.0000	0.0001
				500	12.9	0.0009	0.0029	0.0001	0.0002
				750	1.7	0.0002	0.0006	0.0000	0.0000
				1000	2.9	0.0006	0.0017	0.0001	0.0001
				1500	2.9	0.0008	0.0024	0.0001	0.0002
				2000	1.3	0.0005	0.0015	0.0001	0.0001
				3000	2.0	0.0011	0.0034	0.0002	0.00[illegible]
				10000	0.1	0.0001	0.0002	0.0000	0.0
			Backup Pumps	50	0.9	0.0000	0.0000	0.0000	0.00[illegible]
				120	5.6	0.0001	0.0003	0.0000	0.0000
				175	3.5	0.0001	0.0003	0.0000	0.0000
				250	3.4	0.0001	0.0005	0.0000	0.0000
				500	8.4	0.0006	0.0019	0.0001	0.0001
				750	1.1	0.0001	0.0004	0.0000	0.0000
				1000	1.9	0.0004	0.0011	0.0001	0.0001
				1500	1.9	0.0005	0.0016	0.0001	0.0001
				2000	0.8	0.0003	0.0010	0.0000	0.0001
				3000	1.3	0.0007	0.0022	0.0001	0.0002
				10000	0.0	0.0000	0.0001	0.0000	0.0000
		Merced	Prime Generators	50	0.1	0.0001	0.0001	0.0000	0.0000
				120	0.8	0.0007	0.0016	0.0002	0.0002
				175	0.5	0.0006	0.0017	0.0001	0.0002
				250	0.5	0.0008	0.0023	0.0001	0.0002
				500	1.1	0.0027	0.0084	0.0005	0.0007
				750	0.2	0.0006	0.0018	0.0001	0.0002
				1000	0.3	0.0018	0.0051	0.0003	0.0005
				1500	0.3	0.0025	0.0072	0.0004	0.0006
				2000	0.1	0.0015	0.0043	0.0002	0.0004
				3000	0.2	0.0035	0.0100	0.0005	0.0009
				10000	0.0	0.0002	0.0007	0.0000	0.0001
			Prime Pumps	50	0.1	0.0001	0.0000	0.0000	0.0000
				120	0.5	0.0004	0.0011	0.0001	0.0001
				175	0.3	0.0004	0.0011	0.0001	0.0001
				250	0.3	0.0005	0.0014	0.0001	0.0001
				500	0.7	0.0018	0.0056	0.0003	0.0005
				750	0.1	0.0004	0.0012	0.0001	0.0001
				1000	0.2	0.0012	0.0033	0.0002	0.0[illegible]
				1500	0.2	0.0016	0.0047	0.0002	0.0[illegible]
				2000	0.1	0.0010	0.0028	0.0001	0.0003
				3000	0.1	0.0023	0.0065	0.0003	0.0006

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				10000	0.0	0.0002	0.0004	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0003	0.0008	0.0001	0.0001
				120	0.1	0.0003	0.0008	0.0001	0.0001
				120	0.5	0.0003	0.0008	0.0001	0.0001
				175	0.0	0.0003	0.0008	0.0001	0.0001
				175	0.1	0.0003	0.0008	0.0001	0.0001
				175	0.3	0.0003	0.0008	0.0001	0.0001
				250	0.0	0.0001	0.0003	0.0000	0.0000
				250	0.1	0.0001	0.0003	0.0000	0.0000
				500	0.0	0.0016	0.0050	0.0003	0.0004
				500	0.5	0.0016	0.0050	0.0003	0.0004
				500	0.6	0.0016	0.0050	0.0003	0.0004
				750	0.0	0.0004	0.0011	0.0001	0.0001
				750	0.1	0.0004	0.0011	0.0001	0.0001
				1000	0.0	0.0004	0.0011	0.0001	0.0001
				1000	0.1	0.0004	0.0011	0.0001	0.0001
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	2.3	0.0000	0.0000	0.0000	0.0000
				120	14.7	0.0003	0.0009	0.0001	0.0001
				175	9.1	0.0003	0.0009	0.0000	0.0001
				250	8.8	0.0004	0.0013	0.0001	0.0001
				500	21.8	0.0015	0.0049	0.0002	0.0004
				750	2.9	0.0003	0.0011	0.0000	0.0001
				1000	4.9	0.0010	0.0029	0.0001	0.0002
				1500	4.9	0.0014	0.0041	0.0002	0.0003
				2000	2.1	0.0008	0.0025	0.0001	0.0002
				3000	3.4	0.0019	0.0057	0.0003	0.0005
				10000	0.1	0.0001	0.0004	0.0000	0.0000
			Backup Pumps	50	1.5	0.0000	0.0000	0.0000	0.0000
				120	9.5	0.0002	0.0006	0.0000	0.0001
				175	6.0	0.0002	0.0006	0.0000	0.0001
				250	5.7	0.0003	0.0008	0.0000	0.0001
				500	14.2	0.0010	0.0033	0.0001	0.0003
				750	1.9	0.0002	0.0007	0.0000	0.0001
				1000	3.2	0.0006	0.0019	0.0001	0.0002
				1500	3.2	0.0009	0.0027	0.0001	0.0002
				2000	1.4	0.0005	0.0016	0.0001	0.0001
				3000	2.2	0.0012	0.0037	0.0002	0.0003
				10000	0.1	0.0001	0.0002	0.0000	0.0000
		San Joaquin	Prime Generators	50	0.3	0.0002	0.0002	0.0000	0.0001
				120	2.1	0.0018	0.0045	0.0004	0.0006
				175	1.3	0.0017	0.0045	0.0003	0.0004
				250	1.3	0.0021	0.0063	0.0004	0.0006
				500	3.1	0.0073	0.0230	0.0012	0.0019
				750	0.4	0.0016	0.0050	0.0003	0.0004
				1000	0.7	0.0049	0.0140	0.0007	0.0013
				1500	0.7	0.0069	0.0195	0.0010	0.0017
				2000	0.3	0.0042	0.0118	0.0006	0.0011
				3000	0.5	0.0095	0.0271	0.0014	0.0024
				10000	0.0	0.0006	0.0018	0.0001	0.0002
			Prime Pumps	50	0.2	0.0001	0.0001	0.0000	0.0001
				120	1.4	0.0012	0.0029	0.0003	0.0004
				175	0.9	0.0011	0.0029	0.0002	0.0003
				250	0.8	0.0013	0.0039	0.0002	0.0003
				500	2.0	0.0049	0.0153	0.0008	0.0013

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				750	0.3	0.0010	0.0033	0.0002	0.0003
				1000	0.5	0.0032	0.0091	0.0005	0.0008
				1500	0.5	0.0045	0.0127	0.0006	0.0011
				2000	0.2	0.0027	0.0077	0.0004	0.0007
				3000	0.3	0.0062	0.0176	0.0009	0.0016
				10000	0.0	0.0004	0.0012	0.0001	0.0001
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0009	0.0022	0.0002	0.0003
				120	0.4	0.0009	0.0022	0.0002	0.0003
				120	1.4	0.0009	0.0022	0.0002	0.0003
				175	0.0	0.0008	0.0022	0.0001	0.0002
				175	0.4	0.0008	0.0022	0.0001	0.0002
				175	0.9	0.0008	0.0022	0.0001	0.0002
				250	0.0	0.0003	0.0009	0.0001	0.0001
				250	0.2	0.0003	0.0009	0.0001	0.0001
				500	0.0	0.0043	0.0136	0.0007	0.0012
				500	1.3	0.0043	0.0136	0.0007	0.0012
				500	1.6	0.0043	0.0136	0.0007	0.0012
				750	0.0	0.0010	0.0030	0.0002	0.0003
				750	0.2	0.0010	0.0030	0.0002	0.0003
				1000	0.0	0.0010	0.0029	0.0001	0.0003
				1000	0.4	0.0010	0.0029	0.0001	0.0003
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	6.2	0.0001	0.0001	0.0000	0.0[illegible]
				120	39.9	0.0009	0.0024	0.0002	0.0[illegible]
				175	24.9	0.0009	0.0025	0.0001	0.0002
				250	24.0	0.0011	0.0035	0.0002	0.0003
				500	59.4	0.0041	0.0133	0.0006	0.0010
				750	7.9	0.0009	0.0029	0.0001	0.0002
				1000	13.3	0.0027	0.0080	0.0004	0.0007
				1500	13.3	0.0037	0.0111	0.0005	0.0009
				2000	5.8	0.0023	0.0067	0.0003	0.0005
				3000	9.4	0.0052	0.0154	0.0007	0.0013
				10000	0.3	0.0003	0.0010	0.0000	0.0001
			Backup Pumps	50	4.0	0.0001	0.0001	0.0000	0.0000
				120	25.9	0.0006	0.0015	0.0001	0.0002
				175	16.2	0.0006	0.0016	0.0001	0.0001
				250	15.6	0.0007	0.0022	0.0001	0.0002
				500	38.6	0.0027	0.0089	0.0004	0.0007
				750	5.1	0.0006	0.0019	0.0001	0.0001
				1000	8.7	0.0017	0.0052	0.0002	0.0004
				1500	8.7	0.0024	0.0072	0.0003	0.0006
				2000	3.8	0.0015	0.0044	0.0002	0.0004
				3000	6.1	0.0034	0.0100	0.0005	0.0008
				10000	0.2	0.0002	0.0007	0.0000	0.0001
		Stanislaus	Prime Generators	50	0.3	0.0002	0.0001	0.0000	0.0001
				120	1.7	0.0014	0.0035	0.0003	0.0005
				175	1.0	0.0013	0.0036	0.0002	0.0004
				250	1.0	0.0016	0.0050	0.0003	0.0004
				500	2.5	0.0057	0.0181	0.0010	0.0015
				750	0.3	0.0013	0.0040	0.0002	0.0003
				1000	0.6	0.0039	0.0110	0.0006	0.0010
				1500	0.6	0.0054	0.0154	0.0008	0.[illegible]
				2000	0.2	0.0033	0.0093	0.0005	0.[illegible]
				3000	0.4	0.0075	0.0213	0.0011	0.0019
				10000	0.0	0.0005	0.0014	0.0001	0.0001

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
			Prime Pumps	50	0.2	0.0001	0.0001	0.0000	0.0000
				120	1.1	0.0009	0.0023	0.0002	0.0003
				175	0.7	0.0008	0.0023	0.0002	0.0002
				250	0.6	0.0010	0.0031	0.0002	0.0003
				500	1.6	0.0038	0.0121	0.0007	0.0010
				750	0.2	0.0008	0.0026	0.0001	0.0002
				1000	0.4	0.0025	0.0072	0.0004	0.0006
				1500	0.4	0.0035	0.0100	0.0005	0.0009
				2000	0.2	0.0021	0.0061	0.0003	0.0005
				3000	0.3	0.0049	0.0139	0.0007	0.0012
				10000	0.0	0.0003	0.0009	0.0000	0.0001
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0007	0.0017	0.0002	0.0002
				120	0.3	0.0007	0.0017	0.0002	0.0002
				120	1.1	0.0007	0.0017	0.0002	0.0002
				175	0.0	0.0006	0.0017	0.0001	0.0002
				175	0.3	0.0006	0.0017	0.0001	0.0002
				175	0.7	0.0006	0.0017	0.0001	0.0002
				250	0.0	0.0002	0.0007	0.0000	0.0001
				250	0.1	0.0002	0.0007	0.0000	0.0001
				500	0.0	0.0034	0.0107	0.0006	0.0009
				500	1.0	0.0034	0.0107	0.0006	0.0009
				500	1.3	0.0034	0.0107	0.0006	0.0009
				750	0.0	0.0008	0.0024	0.0001	0.0002
				750	0.1	0.0008	0.0024	0.0001	0.0002
				1000	0.0	0.0008	0.0023	0.0001	0.0002
				1000	0.3	0.0008	0.0023	0.0001	0.0002
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	4.8	0.0001	0.0001	0.0000	0.0000
				120	31.4	0.0007	0.0019	0.0001	0.0002
				175	19.6	0.0007	0.0020	0.0001	0.0002
				250	18.9	0.0009	0.0027	0.0001	0.0002
				500	46.8	0.0032	0.0105	0.0005	0.0008
				750	6.2	0.0007	0.0023	0.0001	0.0002
				1000	10.5	0.0021	0.0063	0.0003	0.0005
				1500	10.5	0.0029	0.0088	0.0004	0.0007
				2000	4.6	0.0018	0.0053	0.0003	0.0004
				3000	7.4	0.0041	0.0121	0.0006	0.0010
				10000	0.3	0.0003	0.0008	0.0000	0.0001
			Backup Pumps	50	3.2	0.0000	0.0001	0.0000	0.0000
				120	20.4	0.0005	0.0012	0.0001	0.0001
				175	12.8	0.0004	0.0013	0.0001	0.0001
				250	12.3	0.0005	0.0017	0.0001	0.0001
				500	30.4	0.0022	0.0070	0.0003	0.0005
				750	4.0	0.0005	0.0015	0.0001	0.0001
				1000	6.8	0.0014	0.0041	0.0002	0.0003
				1500	6.8	0.0019	0.0057	0.0003	0.0005
				2000	3.0	0.0012	0.0035	0.0002	0.0003
				3000	4.8	0.0027	0.0079	0.0004	0.0006
				10000	0.2	0.0002	0.0005	0.0000	0.0000
		Tulare	Prime Generators	50	0.2	0.0001	0.0001	0.0000	0.0001
				120	1.3	0.0011	0.0028	0.0003	0.0004
				175	0.8	0.0011	0.0028	0.0002	0.0003
				250	0.8	0.0013	0.0040	0.0002	0.0004
				500	2.0	0.0046	0.0145	0.0008	0.0012
				750	0.3	0.0010	0.0032	0.0002	0.0003

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				1000	0.4	0.0031	0.0088	0.0004	0.0008
				1500	0.4	0.0043	0.0123	0.0006	0.0011
				2000	0.2	0.0026	0.0075	0.0004	0.0007
				3000	0.3	0.0060	0.0171	0.0009	0.0015
				10000	0.0	0.0004	0.0011	0.0001	0.0001
			Prime Pumps	50	0.1	0.0001	0.0001	0.0000	0.0000
				120	0.9	0.0007	0.0018	0.0002	0.0002
				175	0.5	0.0007	0.0018	0.0001	0.0002
				250	0.5	0.0008	0.0025	0.0001	0.0002
				500	1.3	0.0031	0.0097	0.0005	0.0008
				750	0.2	0.0007	0.0021	0.0001	0.0002
				1000	0.3	0.0020	0.0057	0.0003	0.0005
				1500	0.3	0.0028	0.0080	0.0004	0.0007
				2000	0.1	0.0017	0.0048	0.0002	0.0004
				3000	0.2	0.0039	0.0111	0.0006	0.0010
				10000	0.0	0.0003	0.0007	0.0000	0.0001
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0014	0.0035	0.0003	0.0005
				120	0.2	0.0014	0.0035	0.0003	0.0005
				120	0.9	0.0014	0.0035	0.0003	0.0005
				120	2.0	0.0014	0.0035	0.0003	0.0005
				175	0.0	0.0005	0.0014	0.0001	0.0001
				175	0.2	0.0005	0.0014	0.0001	0.0001
				175	0.6	0.0005	0.0014	0.0001	0.0001
				250	0.0	0.0002	0.0006	0.0000	0.0001
				250	0.1	0.0002	0.0006	0.0000	0.0001
				500	0.0	0.0027	0.0086	0.0005	0.00[illegible]
				500	0.8	0.0027	0.0086	0.0005	0.0
				500	1.0	0.0027	0.0086	0.0005	0.00[illegible]
				750	0.0	0.0006	0.0019	0.0001	0.0002
				750	0.1	0.0006	0.0019	0.0001	0.0002
				1000	0.0	0.0006	0.0018	0.0001	0.0002
				1000	0.2	0.0006	0.0018	0.0001	0.0002
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	3.9	0.0000	0.0001	0.0000	0.0000
				120	25.1	0.0006	0.0015	0.0001	0.0002
				175	15.7	0.0006	0.0016	0.0001	0.0001
				250	15.1	0.0007	0.0022	0.0001	0.0002
				500	37.5	0.0026	0.0084	0.0004	0.0006
				750	5.0	0.0006	0.0018	0.0001	0.0001
				1000	8.4	0.0017	0.0050	0.0002	0.0004
				1500	8.4	0.0024	0.0070	0.0003	0.0006
				2000	3.7	0.0014	0.0042	0.0002	0.0003
				3000	5.9	0.0033	0.0097	0.0005	0.0008
				10000	0.2	0.0002	0.0006	0.0000	0.0001
			Backup Pumps	50	2.5	0.0000	0.0000	0.0000	0.0000
				120	16.4	0.0004	0.0010	0.0001	0.0001
				175	10.2	0.0004	0.0010	0.0001	0.0001
				250	9.8	0.0004	0.0014	0.0001	0.0001
				500	24.4	0.0017	0.0056	0.0003	0.0004
				750	3.2	0.0004	0.0012	0.0001	0.0001
				1000	5.5	0.0011	0.0033	0.0002	0.0003
				1500	5.5	0.0015	0.0046	0.0002	0.0004
				2000	2.4	0.0009	0.0028	0.0001	0.0[illegible]
				3000	3.8	0.0021	0.0063	0.0003	0.0[illegible]
				10000	0.1	0.0001	0.0004	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
San Joaquin Valley Unified APCD Total	0	0	0		2014.4	0.7176	2.1107	0.1134	0.1868
San Luis Obispo County APCD	South Central Coast	San Luis Obispo	Prime Generators	50	0.1	0.0001	0.0001	0.0000	0.0000
				120	0.9	0.0008	0.0019	0.0002	0.0002
				175	0.6	0.0007	0.0019	0.0001	0.0002
				250	0.5	0.0009	0.0027	0.0002	0.0002
				500	1.3	0.0031	0.0097	0.0005	0.0008
				750	0.2	0.0007	0.0021	0.0001	0.0002
				1000	0.3	0.0021	0.0059	0.0003	0.0005
				1500	0.3	0.0029	0.0082	0.0004	0.0007
				2000	0.1	0.0017	0.0050	0.0002	0.0004
				3000	0.2	0.0040	0.0114	0.0006	0.0010
				10000	0.0	0.0003	0.0008	0.0000	0.0001
			Prime Pumps	50	0.1	0.0001	0.0001	0.0000	0.0000
				120	0.6	0.0005	0.0012	0.0001	0.0002
				175	0.4	0.0005	0.0012	0.0001	0.0001
				250	0.3	0.0005	0.0016	0.0001	0.0001
				500	0.9	0.0020	0.0064	0.0003	0.0005
				750	0.1	0.0004	0.0014	0.0001	0.0001
				1000	0.2	0.0013	0.0038	0.0002	0.0003
				1500	0.2	0.0019	0.0053	0.0003	0.0005
				2000	0.1	0.0011	0.0032	0.0002	0.0003
				3000	0.1	0.0026	0.0074	0.0004	0.0007
				10000	0.0	0.0002	0.0005	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	2.6	0.0000	0.0000	0.0000	0.0000
				120	16.8	0.0004	0.0010	0.0001	0.0001
				175	10.5	0.0004	0.0010	0.0001	0.0001
				250	10.1	0.0005	0.0015	0.0001	0.0001
				500	25.0	0.0017	0.0056	0.0003	0.0004
				750	3.3	0.0004	0.0012	0.0001	0.0001
				1000	5.6	0.0011	0.0033	0.0002	0.0003
				1500	5.6	0.0016	0.0047	0.0002	0.0004
				2000	2.4	0.0010	0.0028	0.0001	0.0002
				3000	3.9	0.0022	0.0065	0.0003	0.0005
				10000	0.1	0.0001	0.0004	0.0000	0.0000
			Backup Pumps	50	1.7	0.0000	0.0000	0.0000	0.0000
				120	10.9	0.0003	0.0006	0.0000	0.0001
				175	6.8	0.0002	0.0007	0.0000	0.0001
				250	6.6	0.0003	0.0009	0.0000	0.0001
				500	16.2	0.0012	0.0037	0.0002	0.0003
				750	2.2	0.0002	0.0008	0.0000	0.0001
				1000	3.6	0.0007	0.0022	0.0001	0.0002
				1500	3.6	0.0010	0.0030	0.0001	0.0002
				2000	1.6	0.0006	0.0018	0.0001	0.0002
				3000	2.6	0.0014	0.0042	0.0002	0.0003
				10000	0.1	0.0001	0.0003	0.0000	0.0000
San Luis Obispo County APCD Total	0	0	0		149.2	0.0437	0.1281	0.0067	0.0112

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
Santa Barbara County APCD	South Central Coast	Santa Barbara	Prime Generators	50	0.2	0.0001	0.0001	0.0000	0.0001
				120	1.4	0.0012	0.0030	0.0003	0.0004
				175	0.9	0.0011	0.0030	0.0002	0.0003
				250	0.8	0.0014	0.0043	0.0003	0.0004
				500	2.1	0.0049	0.0155	0.0008	0.0013
				750	0.3	0.0011	0.0034	0.0002	0.0003
				1000	0.5	0.0033	0.0094	0.0005	0.0008
				1500	0.5	0.0046	0.0131	0.0007	0.0012
				2000	0.2	0.0028	0.0080	0.0004	0.0007
				3000	0.3	0.0064	0.0182	0.0009	0.0016
				10000	0.0	0.0004	0.0012	0.0001	0.0001
			Prime Pumps	50	0.1	0.0001	0.0001	0.0000	0.0000
				120	0.9	0.0008	0.0020	0.0002	0.0003
				175	0.6	0.0007	0.0020	0.0001	0.0002
				250	0.6	0.0009	0.0026	0.0002	0.0002
				500	1.4	0.0033	0.0103	0.0006	0.0009
				750	0.2	0.0007	0.0022	0.0001	0.0002
				1000	0.3	0.0022	0.0061	0.0003	0.0005
				1500	0.3	0.0030	0.0085	0.0004	0.0008
				2000	0.1	0.0018	0.0052	0.0003	0.0005
				3000	0.2	0.0042	0.0119	0.0006	0.0011
				10000	0.0	0.0003	0.0008	0.0000	0.0001
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.00[illegible]
				500	0.0	0.0000	0.0000	0.0000	0.0[illegible]
				750	0.0	0.0000	0.0000	0.0000	0.00[illegible]
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	4.1	0.0000	0.0001	0.0000	0.0000
				120	26.8	0.0006	0.0016	0.0001	0.0002
				175	16.7	0.0006	0.0017	0.0001	0.0001
				250	16.1	0.0007	0.0024	0.0001	0.0002
				500	40.0	0.0028	0.0090	0.0004	0.0007
				750	5.3	0.0006	0.0020	0.0001	0.0002
				1000	9.0	0.0018	0.0054	0.0003	0.0004
				1500	9.0	0.0025	0.0075	0.0004	0.0006
				2000	3.9	0.0015	0.0045	0.0002	0.0004
				3000	6.3	0.0035	0.0104	0.0005	0.0008
				10000	0.2	0.0002	0.0007	0.0000	0.0001
			Backup Pumps	50	2.7	0.0000	0.0000	0.0000	0.0000
				120	17.5	0.0004	0.0010	0.0001	0.0001
				175	10.9	0.0004	0.0011	0.0001	0.0001
				250	10.5	0.0005	0.0014	0.0001	0.0001
				500	26.0	0.0018	0.0060	0.0003	0.0005
				750	3.5	0.0004	0.0013	0.0001	0.0001
				1000	5.8	0.0012	0.0035	0.0002	0.0003
				1500	5.8	0.0016	0.0049	0.0002	0.0004
				2000	2.5	0.0010	0.0029	0.0001	0.0002
				3000	4.1	0.0023	0.0068	0.0003	0.0006
				10000	0.1	0.0002	0.0005	0.0000	0.0000
Santa Barbara County APCD Total		0	0	0	239.1	0.0700	0.2053	0.0107	0.0[illegible]
Shasta County AQMD	Sacramento Valley	Shasta	Prime Generators	50	0.1	0.0001	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				120	0.6	0.0005	0.0013	0.0001	0.0002
				175	0.4	0.0005	0.0013	0.0001	0.0001
				250	0.4	0.0006	0.0018	0.0001	0.0002
				500	0.9	0.0021	0.0065	0.0004	0.0005
				750	0.1	0.0005	0.0014	0.0001	0.0001
				1000	0.2	0.0014	0.0040	0.0002	0.0004
				1500	0.2	0.0019	0.0055	0.0003	0.0005
				2000	0.1	0.0012	0.0033	0.0002	0.0003
				3000	0.1	0.0027	0.0076	0.0004	0.0007
				10000	0.0	0.0002	0.0005	0.0000	0.0000
			Prime Pumps	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.4	0.0003	0.0008	0.0001	0.0001
				175	0.2	0.0003	0.0008	0.0001	0.0001
				250	0.2	0.0004	0.0011	0.0001	0.0001
				500	0.6	0.0014	0.0043	0.0002	0.0004
				750	0.1	0.0003	0.0009	0.0001	0.0001
				1000	0.1	0.0009	0.0026	0.0001	0.0002
				1500	0.1	0.0013	0.0036	0.0002	0.0003
				2000	0.1	0.0008	0.0022	0.0001	0.0002
				3000	0.1	0.0018	0.0050	0.0003	0.0004
				10000	0.0	0.0001	0.0003	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	1.7	0.0000	0.0000	0.0000	0.0000
				120	11.3	0.0003	0.0007	0.0000	0.0001
				175	7.0	0.0002	0.0007	0.0000	0.0001
				250	6.8	0.0003	0.0010	0.0000	0.0001
				500	16.8	0.0012	0.0038	0.0002	0.0003
				750	2.2	0.0003	0.0008	0.0000	0.0001
				1000	3.8	0.0008	0.0023	0.0001	0.0002
				1500	3.8	0.0011	0.0031	0.0002	0.0003
				2000	1.6	0.0006	0.0019	0.0001	0.0002
				3000	2.6	0.0015	0.0044	0.0002	0.0004
				10000	0.1	0.0001	0.0003	0.0000	0.0000
			Backup Pumps	50	1.1	0.0000	0.0000	0.0000	0.0000
				120	7.3	0.0002	0.0004	0.0000	0.0001
				175	4.6	0.0002	0.0004	0.0000	0.0000
				250	4.4	0.0002	0.0006	0.0000	0.0000
				500	10.9	0.0008	0.0025	0.0001	0.0002
				750	1.5	0.0002	0.0005	0.0000	0.0000
				1000	2.4	0.0005	0.0015	0.0001	0.0001
				1500	2.5	0.0007	0.0020	0.0001	0.0002
				2000	1.1	0.0004	0.0012	0.0001	0.0001
				3000	1.7	0.0010	0.0028	0.0001	0.0002
				10000	0.1	0.0001	0.0002	0.0000	0.0000
Shasta County AQMD Total		0	0	0	100.3	0.0294	0.0861	0.0045	0.0076
Siskiyou County APCD	Northeast Plateau	Siskiyou	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.2	0.0001	0.0003	0.0000	0.0000
				175	0.1	0.0001	0.0003	0.0000	0.0000
				250	0.1	0.0002	0.0005	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				500	0.2	0.0005	0.0017	0.0001	0.0001
				750	0.0	0.0001	0.0004	0.0000	0.0000
				1000	0.1	0.0004	0.0010	0.0001	0.0001
				1500	0.1	0.0005	0.0014	0.0001	0.0001
				2000	0.0	0.0003	0.0009	0.0000	0.0001
				3000	0.0	0.0007	0.0020	0.0001	0.0002
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0002	0.0000	0.0000
				175	0.1	0.0001	0.0002	0.0000	0.0000
				250	0.1	0.0001	0.0003	0.0000	0.0000
				500	0.1	0.0004	0.0011	0.0001	0.0001
				750	0.0	0.0001	0.0002	0.0000	0.0000
				1000	0.0	0.0002	0.0007	0.0000	0.0001
				1500	0.0	0.0003	0.0009	0.0000	0.0001
				2000	0.0	0.0002	0.0006	0.0000	0.0001
				3000	0.0	0.0005	0.0013	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0[illegible]
				3000	0.0	0.0000	0.0000	0.0000	0.0[illegible]
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.5	0.0000	0.0000	0.0000	0.0000
				120	2.9	0.0001	0.0002	0.0000	0.0000
				175	1.8	0.0001	0.0002	0.0000	0.0000
				250	1.8	0.0001	0.0003	0.0000	0.0000
				500	4.3	0.0003	0.0010	0.0000	0.0001
				750	0.6	0.0001	0.0002	0.0000	0.0000
				1000	1.0	0.0002	0.0006	0.0000	0.0000
				1500	1.0	0.0003	0.0008	0.0000	0.0001
				2000	0.4	0.0002	0.0005	0.0000	0.0000
				3000	0.7	0.0004	0.0011	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Backup Pumps	50	0.3	0.0000	0.0000	0.0000	0.0000
				120	1.9	0.0000	0.0001	0.0000	0.0000
				175	1.2	0.0000	0.0001	0.0000	0.0000
				250	1.1	0.0001	0.0002	0.0000	0.0000
				500	2.8	0.0002	0.0006	0.0000	0.0000
				750	0.4	0.0000	0.0001	0.0000	0.0000
				1000	0.6	0.0001	0.0004	0.0000	0.0000
				1500	0.6	0.0002	0.0005	0.0000	0.0000
				2000	0.3	0.0001	0.0003	0.0000	0.0000
				3000	0.4	0.0002	0.0007	0.0000	0.0001
				10000	0.0	0.0000	0.0000	0.0000	0.0000
Siskiyou County APCD Total		0	0	0	26.0	0.0076	0.0223	0.0012	0.0020
South Coast AQMD	Mojave Desert	Riverside	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0001	0.0000	0.0000
				175	0.0	0.0000	0.0001	0.0000	0.0[illegible]
				250	0.0	0.0000	0.0001	0.0000	0.0[illegible]
				500	0.1	0.0001	0.0004	0.0000	0.0000
				750	0.0	0.0000	0.0001	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				1000	0.0	0.0001	0.0002	0.0000	0.0000
				1500	0.0	0.0001	0.0003	0.0000	0.0000
				2000	0.0	0.0001	0.0002	0.0000	0.0000
				3000	0.0	0.0002	0.0005	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0001	0.0000	0.0000
				500	0.0	0.0001	0.0003	0.0000	0.0000
				750	0.0	0.0000	0.0001	0.0000	0.0000
				1000	0.0	0.0001	0.0002	0.0000	0.0000
				1500	0.0	0.0001	0.0002	0.0000	0.0000
				2000	0.0	0.0000	0.0001	0.0000	0.0000
				3000	0.0	0.0001	0.0003	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.7	0.0000	0.0000	0.0000	0.0000
				175	0.4	0.0000	0.0000	0.0000	0.0000
				250	0.4	0.0000	0.0001	0.0000	0.0000
				500	1.0	0.0001	0.0002	0.0000	0.0000
				750	0.1	0.0000	0.0000	0.0000	0.0000
				1000	0.2	0.0000	0.0001	0.0000	0.0000
				1500	0.2	0.0001	0.0002	0.0000	0.0000
				2000	0.1	0.0000	0.0001	0.0000	0.0000
				3000	0.2	0.0001	0.0003	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Pumps	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.4	0.0000	0.0000	0.0000	0.0000
				175	0.3	0.0000	0.0000	0.0000	0.0000
				250	0.3	0.0000	0.0000	0.0000	0.0000
				500	0.6	0.0000	0.0001	0.0000	0.0000
				750	0.1	0.0000	0.0000	0.0000	0.0000
				1000	0.1	0.0000	0.0001	0.0000	0.0000
				1500	0.1	0.0000	0.0001	0.0000	0.0000
				2000	0.1	0.0000	0.0001	0.0000	0.0000
				3000	0.1	0.0001	0.0002	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				10000	0.0	0.0000	0.0000	0.0000	0.0000
	Salton Sea		Prime Generators	50	0.2	0.0001	0.0001	0.0000	0.0000
				120	1.2	0.0010	0.0026	0.0003	0.0003
				175	0.8	0.0010	0.0026	0.0002	0.0003
				250	0.7	0.0012	0.0037	0.0002	0.0003
				500	1.8	0.0042	0.0133	0.0007	0.0011
				750	0.2	0.0009	0.0029	0.0002	0.0002
				1000	0.4	0.0029	0.0081	0.0004	0.0007
				1500	0.4	0.0040	0.0113	0.0006	0.0010
				2000	0.2	0.0024	0.0068	0.0003	0.0006
				3000	0.3	0.0055	0.0157	0.0008	0.0014
				10000	0.0	0.0004	0.0010	0.0001	0.0001
			Prime Pumps	50	0.1	0.0001	0.0001	0.0000	0.0000
				120	0.8	0.0007	0.0017	0.0002	0.0002
				175	0.5	0.0006	0.0017	0.0001	0.0002
				250	0.5	0.0007	0.0023	0.0001	0.0002
				500	1.2	0.0028	0.0089	0.0005	0.0007
				750	0.2	0.0006	0.0019	0.0001	0.0002
				1000	0.3	0.0019	0.0053	0.0003	0.0005
				1500	0.3	0.0026	0.0074	0.0004	0.0007
				2000	0.1	0.0016	0.0045	0.0002	0.0004
				3000	0.2	0.0036	0.0102	0.0005	0.0009
				10000	0.0	0.0002	0.0007	0.0000	0.0001
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0003	0.0006	0.0001	0.0001
				120	0.0	0.0003	0.0006	0.0001	0.00[illegible]
				120	0.1	0.0003	0.0006	0.0001	0.0[illegible]
				120	0.5	0.0003	0.0006	0.0001	0.00[illegible]
				175	0.0	0.0002	0.0006	0.0000	0.0001
				175	0.1	0.0002	0.0006	0.0000	0.0001
				175	0.2	0.0002	0.0006	0.0000	0.0001
				250	0.0	0.0004	0.0011	0.0001	0.0001
				250	0.0	0.0004	0.0011	0.0001	0.0001
				250	0.1	0.0004	0.0011	0.0001	0.0001
				250	0.4	0.0004	0.0011	0.0001	0.0001
				500	0.0	0.0004	0.0012	0.0001	0.0001
				500	0.1	0.0004	0.0012	0.0001	0.0001
				500	0.1	0.0004	0.0012	0.0001	0.0001
				500	0.2	0.0004	0.0012	0.0001	0.0001
				750	0.0	0.0001	0.0004	0.0000	0.0000
				750	0.1	0.0001	0.0004	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	3.6	0.0000	0.0001	0.0000	0.0000
				120	23.1	0.0005	0.0014	0.0001	0.0002
				175	14.4	0.0005	0.0014	0.0001	0.0001
				250	13.9	0.0006	0.0020	0.0001	0.0002
				500	34.4	0.0024	0.0077	0.0003	0.0006
				750	4.6	0.0005	0.0017	0.0001	0.0001
				1000	7.7	0.0016	0.0046	0.0002	0.0004
				1500	7.7	0.0022	0.0064	0.0003	0.0005
				2000	3.4	0.0013	0.0039	0.0002	0.0003
				3000	5.4	0.0030	0.0089	0.0004	0.0[illegible]
				10000	0.2	0.0002	0.0006	0.0000	0.0[illegible]
			Backup Pumps	50	2.3	0.0000	0.0000	0.0000	0.0000
				120	15.0	0.0003	0.0009	0.0001	0.0001

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				175	9.4	0.0003	0.0009	0.0000	0.0001
				250	9.0	0.0004	0.0012	0.0001	0.0001
				500	22.4	0.0016	0.0051	0.0002	0.0004
				750	3.0	0.0003	0.0011	0.0000	0.0001
				1000	5.0	0.0010	0.0030	0.0001	0.0002
				1500	5.0	0.0014	0.0042	0.0002	0.0003
				2000	2.2	0.0009	0.0025	0.0001	0.0002
				3000	3.5	0.0020	0.0058	0.0003	0.0005
				10000	0.1	0.0001	0.0004	0.0000	0.0000
	South Coast	Los Angeles	Prime Generators	50	5.1	0.0032	0.0027	0.0004	0.0013
				120	33.2	0.0285	0.0706	0.0070	0.0094
				175	20.7	0.0264	0.0715	0.0047	0.0070
				250	20.0	0.0327	0.1001	0.0059	0.0090
				500	49.5	0.1155	0.3638	0.0197	0.0305
				750	6.6	0.0253	0.0795	0.0043	0.0067
				1000	11.1	0.0779	0.2214	0.0111	0.0199
				1500	11.1	0.1086	0.3088	0.0155	0.0277
				2000	4.8	0.0658	0.1871	0.0094	0.0168
				3000	7.8	0.1508	0.4286	0.0216	0.0385
				10000	0.3	0.0101	0.0286	0.0014	0.0026
			Prime Pumps	50	3.3	0.0023	0.0020	0.0003	0.0009
				120	21.6	0.0186	0.0460	0.0046	0.0061
				175	13.5	0.0170	0.0459	0.0030	0.0045
				250	13.0	0.0202	0.0617	0.0036	0.0055
				500	32.2	0.0770	0.2426	0.0131	0.0203
				750	4.3	0.0165	0.0517	0.0028	0.0044
				1000	7.2	0.0507	0.1441	0.0072	0.0129
				1500	7.2	0.0707	0.2010	0.0101	0.0180
				2000	3.1	0.0428	0.1217	0.0061	0.0109
				3000	5.1	0.0981	0.2789	0.0140	0.0250
				10000	0.2	0.0066	0.0186	0.0009	0.0017
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0069	0.0172	0.0016	0.0022
				120	0.6	0.0069	0.0172	0.0016	0.0022
				120	2.5	0.0069	0.0172	0.0016	0.0022
				120	13.5	0.0069	0.0172	0.0016	0.0022
				175	0.0	0.0059	0.0159	0.0010	0.0016
				175	3.7	0.0059	0.0159	0.0010	0.0016
				175	6.8	0.0059	0.0159	0.0010	0.0016
				250	0.0	0.0101	0.0308	0.0018	0.0028
				250	1.2	0.0101	0.0308	0.0018	0.0028
				250	1.8	0.0101	0.0308	0.0018	0.0028
				250	11.7	0.0101	0.0308	0.0018	0.0028
				500	0.0	0.0100	0.0314	0.0017	0.0026
				500	1.8	0.0100	0.0314	0.0017	0.0026
				500	3.1	0.0100	0.0314	0.0017	0.0026
				500	4.3	0.0100	0.0314	0.0017	0.0026
				750	0.0	0.0031	0.0098	0.0005	0.0008
				750	1.8	0.0031	0.0098	0.0005	0.0008
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	97.5	0.0011	0.0015	0.0002	0.0004
				120	631.5	0.0147	0.0376	0.0028	0.0043
				175	393.9	0.0139	0.0393	0.0020	0.0034
				250	379.7	0.0176	0.0553	0.0026	0.0045
				500	940.5	0.0650	0.2107	0.0094	0.0162

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				750	125.0	0.0142	0.0459	0.0021	0.0036
				1000	211.0	0.0425	0.1262	0.0060	0.0103
				1500	211.3	0.0593	0.1760	0.0084	0.0144
				2000	91.8	0.0359	0.1066	0.0051	0.0087
				3000	148.5	0.0823	0.2443	0.0117	0.0199
				10000	5.1	0.0055	0.0163	0.0008	0.0013
			Backup Pumps	50	63.4	0.0008	0.0011	0.0001	0.0003
				120	410.9	0.0096	0.0244	0.0018	0.0028
				175	256.3	0.0089	0.0252	0.0013	0.0022
				250	247.1	0.0109	0.0341	0.0016	0.0028
				500	612.1	0.0433	0.1405	0.0063	0.0108
				750	81.3	0.0093	0.0299	0.0013	0.0023
				1000	137.3	0.0277	0.0821	0.0039	0.0067
				1500	137.5	0.0386	0.1145	0.0055	0.0093
				2000	59.7	0.0234	0.0694	0.0033	0.0057
				3000	96.7	0.0536	0.1590	0.0076	0.0130
				10000	3.3	0.0036	0.0106	0.0005	0.0009
		Orange	Prime Generators	50	1.6	0.0010	0.0008	0.0001	0.0004
				120	10.2	0.0088	0.0218	0.0022	0.0029
				175	6.4	0.0081	0.0220	0.0014	0.0022
				250	6.2	0.0101	0.0308	0.0018	0.0028
				500	15.2	0.0356	0.1121	0.0061	0.0094
				750	2.0	0.0078	0.0245	0.0013	0.0021
				1000	3.4	0.0240	0.0682	0.0034	0.0061
				1500	3.4	0.0335	0.0951	0.0048	0.0085
				2000	1.5	0.0203	0.0576	0.0029	0.00[illegible]
				3000	2.4	0.0464	0.1320	0.0066	0.0
				10000	0.1	0.0031	0.0088	0.0004	0.00[illegible]
			Prime Pumps	50	1.0	0.0007	0.0006	0.0001	0.0003
				120	6.7	0.0057	0.0142	0.0014	0.0019
				175	4.2	0.0052	0.0141	0.0009	0.0014
				250	4.0	0.0062	0.0190	0.0011	0.0017
				500	9.9	0.0237	0.0747	0.0040	0.0063
				750	1.3	0.0051	0.0159	0.0009	0.0014
				1000	2.2	0.0156	0.0444	0.0022	0.0040
				1500	2.2	0.0218	0.0619	0.0031	0.0056
				2000	1.0	0.0132	0.0375	0.0019	0.0034
				3000	1.6	0.0302	0.0859	0.0043	0.0077
				10000	0.1	0.0020	0.0057	0.0003	0.0005
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0021	0.0053	0.0005	0.0007
				120	0.2	0.0021	0.0053	0.0005	0.0007
				120	0.8	0.0021	0.0053	0.0005	0.0007
				120	4.2	0.0021	0.0053	0.0005	0.0007
				175	0.0	0.0018	0.0049	0.0003	0.0005
				175	1.1	0.0018	0.0049	0.0003	0.0005
				175	2.1	0.0018	0.0049	0.0003	0.0005
				250	0.0	0.0031	0.0095	0.0006	0.0009
				250	0.4	0.0031	0.0095	0.0006	0.0009
				250	0.6	0.0031	0.0095	0.0006	0.0009
				250	3.6	0.0031	0.0095	0.0006	0.0009
				500	0.0	0.0031	0.0097	0.0005	0.0008
				500	0.6	0.0031	0.0097	0.0005	0.0008
				500	0.9	0.0031	0.0097	0.0005	0.0008
				500	1.3	0.0031	0.0097	0.0005	0.0008
				750	0.0	0.0010	0.0030	0.0002	0.0003
				750	0.6	0.0010	0.0030	0.0002	0.0[illegible]
				1000	0.0	0.0000	0.0000	0.0000	0.0[illegible]
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	30.0	0.0003	0.0005	0.0001	0.0001
				120	194.5	0.0045	0.0116	0.0009	0.0013
				175	121.3	0.0043	0.0121	0.0006	0.0011
				250	117.0	0.0054	0.0170	0.0008	0.0014
				500	289.7	0.0200	0.0649	0.0029	0.0050
				750	38.5	0.0044	0.0141	0.0006	0.0011
				1000	65.0	0.0131	0.0389	0.0019	0.0032
				1500	65.1	0.0183	0.0542	0.0026	0.0044
				2000	28.3	0.0111	0.0328	0.0016	0.0027
				3000	45.8	0.0254	0.0752	0.0036	0.0061
				10000	1.6	0.0017	0.0050	0.0002	0.0004
			Backup Pumps	50	19.5	0.0002	0.0003	0.0000	0.0001
				120	126.6	0.0029	0.0075	0.0006	0.0009
				175	79.0	0.0027	0.0078	0.0004	0.0007
				250	76.1	0.0033	0.0105	0.0005	0.0008
				500	188.5	0.0134	0.0433	0.0019	0.0033
				750	25.0	0.0028	0.0092	0.0004	0.0007
				1000	42.3	0.0085	0.0253	0.0012	0.0021
				1500	42.4	0.0119	0.0353	0.0017	0.0029
				2000	18.4	0.0072	0.0214	0.0010	0.0017
				3000	29.8	0.0165	0.0490	0.0023	0.0040
				10000	1.0	0.0011	0.0033	0.0002	0.0003
		Riverside	Prime Generators	50	0.7	0.0004	0.0004	0.0001	0.0002
				120	4.5	0.0039	0.0096	0.0009	0.0013
				175	2.8	0.0036	0.0097	0.0006	0.0010
				250	2.7	0.0044	0.0135	0.0008	0.0012
				500	6.7	0.0156	0.0492	0.0027	0.0041
				750	0.9	0.0034	0.0108	0.0006	0.0009
				1000	1.5	0.0105	0.0300	0.0015	0.0027
				1500	1.5	0.0147	0.0418	0.0021	0.0038
				2000	0.7	0.0089	0.0253	0.0013	0.0023
				3000	1.1	0.0204	0.0580	0.0029	0.0052
				10000	0.0	0.0014	0.0039	0.0002	0.0003
			Prime Pumps	50	0.5	0.0003	0.0003	0.0000	0.0001
				120	2.9	0.0025	0.0062	0.0006	0.0008
				175	1.8	0.0023	0.0062	0.0004	0.0006
				250	1.8	0.0027	0.0084	0.0005	0.0007
				500	4.4	0.0104	0.0328	0.0018	0.0028
				750	0.6	0.0022	0.0070	0.0004	0.0006
				1000	1.0	0.0069	0.0195	0.0010	0.0018
				1500	1.0	0.0096	0.0272	0.0014	0.0024
				2000	0.4	0.0058	0.0165	0.0008	0.0015
				3000	0.7	0.0133	0.0377	0.0019	0.0034
				10000	0.0	0.0009	0.0025	0.0001	0.0002
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0009	0.0023	0.0002	0.0003
				120	0.1	0.0009	0.0023	0.0002	0.0003
				120	0.3	0.0009	0.0023	0.0002	0.0003
				120	1.8	0.0009	0.0023	0.0002	0.0003
				175	0.0	0.0008	0.0021	0.0001	0.0002
				175	0.5	0.0008	0.0021	0.0001	0.0002
				175	0.9	0.0008	0.0021	0.0001	0.0002
				250	0.0	0.0014	0.0042	0.0002	0.0004
				250	0.2	0.0014	0.0042	0.0002	0.0004
				250	0.2	0.0014	0.0042	0.0002	0.0004
				250	1.6	0.0014	0.0042	0.0002	0.0004
				500	0.0	0.0013	0.0043	0.0002	0.0004

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				500	0.2	0.0013	0.0043	0.0002	0.0004
				500	0.4	0.0013	0.0043	0.0002	0.0004
				500	0.6	0.0013	0.0043	0.0002	0.0004
				750	0.0	0.0004	0.0013	0.0001	0.0001
				750	0.2	0.0004	0.0013	0.0001	0.0001
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	13.2	0.0001	0.0002	0.0000	0.0001
				120	85.5	0.0020	0.0051	0.0004	0.0006
				175	53.3	0.0019	0.0053	0.0003	0.0005
				250	51.4	0.0024	0.0075	0.0004	0.0006
				500	127.3	0.0088	0.0285	0.0013	0.0022
				750	16.9	0.0019	0.0062	0.0003	0.0005
				1000	28.6	0.0058	0.0171	0.0008	0.0014
				1500	28.6	0.0080	0.0238	0.0011	0.0019
				2000	12.4	0.0049	0.0144	0.0007	0.0012
				3000	20.1	0.0111	0.0331	0.0016	0.0027
				10000	0.7	0.0007	0.0022	0.0001	0.0002
			Backup Pumps	50	8.6	0.0001	0.0001	0.0000	0.0000
				120	55.6	0.0013	0.0033	0.0002	0.0004
				175	34.7	0.0012	0.0034	0.0002	0.0003
				250	33.4	0.0015	0.0046	0.0002	0.0004
				500	82.8	0.0059	0.0190	0.0009	0.00[illegible]
				750	11.0	0.0013	0.0040	0.0002	0.0[illegible]
				1000	18.6	0.0037	0.0111	0.0005	0.000[illegible]
				1500	18.6	0.0052	0.0155	0.0007	0.0013
				2000	8.1	0.0032	0.0094	0.0004	0.0008
				3000	13.1	0.0072	0.0215	0.0010	0.0018
				10000	0.5	0.0005	0.0014	0.0001	0.0001
		San Bernardino	Prime Generators	50	0.8	0.0005	0.0004	0.0001	0.0002
				120	4.9	0.0042	0.0104	0.0010	0.0014
				175	3.0	0.0039	0.0105	0.0007	0.0010
				250	2.9	0.0048	0.0147	0.0009	0.0013
				500	7.3	0.0170	0.0534	0.0029	0.0045
				750	1.0	0.0037	0.0117	0.0006	0.0010
				1000	1.6	0.0114	0.0325	0.0016	0.0029
				1500	1.6	0.0160	0.0454	0.0023	0.0041
				2000	0.7	0.0097	0.0275	0.0014	0.0025
				3000	1.1	0.0222	0.0630	0.0032	0.0057
				10000	0.0	0.0015	0.0042	0.0002	0.0004
			Prime Pumps	50	0.5	0.0003	0.0003	0.0000	0.0001
				120	3.2	0.0027	0.0068	0.0007	0.0009
				175	2.0	0.0025	0.0067	0.0004	0.0007
				250	1.9	0.0030	0.0091	0.0005	0.0008
				500	4.7	0.0113	0.0356	0.0019	0.0030
				750	0.6	0.0024	0.0076	0.0004	0.0006
				1000	1.1	0.0074	0.0212	0.0011	0.0019
				1500	1.1	0.0104	0.0295	0.0015	0.0026
				2000	0.5	0.0063	0.0179	0.0009	0.0016
				3000	0.7	0.0144	0.0410	0.0021	0.0037
				10000	0.0	0.0010	0.0027	0.0001	0.0002
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0010	0.0025	0.0002	0.0[illegible]
				120	0.1	0.0010	0.0025	0.0002	0.00[illegible]
				120	0.4	0.0010	0.0025	0.0002	0.0003
				120	2.0	0.0010	0.0025	0.0002	0.0003

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				175	0.0	0.0009	0.0023	0.0002	0.0002
				175	0.5	0.0009	0.0023	0.0002	0.0002
				175	1.0	0.0009	0.0023	0.0002	0.0002
				250	0.0	0.0015	0.0045	0.0003	0.0004
				250	0.2	0.0015	0.0045	0.0003	0.0004
				250	0.3	0.0015	0.0045	0.0003	0.0004
				250	1.7	0.0015	0.0045	0.0003	0.0004
				500	0.0	0.0015	0.0046	0.0002	0.0004
				500	0.3	0.0015	0.0046	0.0002	0.0004
				500	0.5	0.0015	0.0046	0.0002	0.0004
				500	0.6	0.0015	0.0046	0.0002	0.0004
				750	0.0	0.0005	0.0014	0.0001	0.0001
				750	0.3	0.0005	0.0014	0.0001	0.0001
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	14.3	0.0002	0.0002	0.0000	0.0001
				120	92.8	0.0022	0.0055	0.0004	0.0006
				175	57.9	0.0020	0.0058	0.0003	0.0005
				250	55.8	0.0026	0.0081	0.0004	0.0007
				500	138.2	0.0095	0.0310	0.0014	0.0024
				750	18.4	0.0021	0.0067	0.0003	0.0005
				1000	31.0	0.0062	0.0185	0.0009	0.0015
				1500	31.0	0.0087	0.0259	0.0012	0.0021
				2000	13.5	0.0053	0.0157	0.0008	0.0013
				3000	21.8	0.0121	0.0359	0.0017	0.0029
				10000	0.8	0.0008	0.0024	0.0001	0.0002
			Backup Pumps	50	9.3	0.0001	0.0002	0.0000	0.0000
				120	60.4	0.0014	0.0036	0.0003	0.0004
				175	37.7	0.0013	0.0037	0.0002	0.0003
				250	36.3	0.0016	0.0050	0.0002	0.0004
				500	89.9	0.0064	0.0206	0.0009	0.0016
				750	11.9	0.0014	0.0044	0.0002	0.0003
				1000	20.2	0.0041	0.0121	0.0006	0.0010
				1500	20.2	0.0057	0.0168	0.0008	0.0014
				2000	8.8	0.0034	0.0102	0.0005	0.0008
				3000	14.2	0.0079	0.0234	0.0011	0.0019
				10000	0.5	0.0005	0.0016	0.0001	0.0001
South Coast AQMD Total		0	0	0	9239.3	2.8953	8.4854	0.4495	0.7494
Tehama County APCD	Sacramento Valley	Tehama	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.2	0.0002	0.0004	0.0000	0.0001
				175	0.1	0.0002	0.0004	0.0000	0.0000
				250	0.1	0.0002	0.0006	0.0000	0.0001
				500	0.3	0.0007	0.0022	0.0001	0.0002
				750	0.0	0.0002	0.0005	0.0000	0.0000
				1000	0.1	0.0005	0.0013	0.0001	0.0001
				1500	0.1	0.0006	0.0018	0.0001	0.0002
				2000	0.0	0.0004	0.0011	0.0001	0.0001
				3000	0.0	0.0009	0.0026	0.0001	0.0002
				10000	0.0	0.0001	0.0002	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0003	0.0000	0.0000
				175	0.1	0.0001	0.0003	0.0000	0.0000
				250	0.1	0.0001	0.0004	0.0000	0.0000
				500	0.2	0.0005	0.0014	0.0001	0.0001
				750	0.0	0.0001	0.0003	0.0000	0.0000
				1000	0.0	0.0003	0.0009	0.0000	0.0001

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day CO	NOx	PM	ROG
				1500	0.0	0.0004	0.0012	0.0001	0.0001
				2000	0.0	0.0003	0.0007	0.0000	0.0001
				3000	0.0	0.0006	0.0017	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.6	0.0000	0.0000	0.0000	0.0000
				120	3.8	0.0001	0.0002	0.0000	0.0000
				175	2.4	0.0001	0.0002	0.0000	0.0000
				250	2.3	0.0001	0.0003	0.0000	0.0000
				500	5.6	0.0004	0.0013	0.0001	0.0001
				750	0.7	0.0001	0.0003	0.0000	0.0000
				1000	1.3	0.0003	0.0008	0.0000	0.0001
				1500	1.3	0.0004	0.0011	0.0001	0.0001
				2000	0.5	0.0002	0.0006	0.0000	0.0001
				3000	0.9	0.0005	0.0015	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Backup Pumps	50	0.4	0.0000	0.0000	0.0000	0.0
				120	2.5	0.0001	0.0001	0.0000	0.0
				175	1.5	0.0001	0.0002	0.0000	0.0000
				250	1.5	0.0001	0.0002	0.0000	0.0000
				500	3.7	0.0003	0.0008	0.0000	0.0001
				750	0.5	0.0001	0.0002	0.0000	0.0000
				1000	0.8	0.0002	0.0005	0.0000	0.0000
				1500	0.8	0.0002	0.0007	0.0000	0.0001
				2000	0.4	0.0001	0.0004	0.0000	0.0000
				3000	0.6	0.0003	0.0009	0.0000	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
Tehama County APCD Total		0	0	0	33.6	0.0098	0.0288	0.0015	0.0025
Tuolumne County APCD	Mountain Counties	Tuolumne	Prime Generators	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.2	0.0002	0.0004	0.0000	0.0001
				175	0.1	0.0002	0.0004	0.0000	0.0000
				250	0.1	0.0002	0.0006	0.0000	0.0001
				500	0.3	0.0007	0.0021	0.0001	0.0002
				750	0.0	0.0001	0.0005	0.0000	0.0000
				1000	0.1	0.0005	0.0013	0.0001	0.0001
				1500	0.1	0.0006	0.0018	0.0001	0.0002
				2000	0.0	0.0004	0.0011	0.0001	0.0001
				3000	0.0	0.0009	0.0025	0.0001	0.0002
				10000	0.0	0.0001	0.0002	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.1	0.0001	0.0003	0.0000	0.0000
				175	0.1	0.0001	0.0003	0.0000	0.0000
				250	0.1	0.0001	0.0004	0.0000	0.0000
				500	0.2	0.0005	0.0014	0.0001	0.0001
				750	0.0	0.0001	0.0003	0.0000	0.0
				1000	0.0	0.0003	0.0008	0.0000	0.0
				1500	0.0	0.0004	0.0012	0.0001	0.000
				2000	0.0	0.0003	0.0007	0.0000	0.0001

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				3000	0.0	0.0006	0.0016	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	0.6	0.0000	0.0000	0.0000	0.0000
				120	3.7	0.0001	0.0002	0.0000	0.0000
				175	2.3	0.0001	0.0002	0.0000	0.0000
				250	2.2	0.0001	0.0003	0.0000	0.0000
				500	5.5	0.0004	0.0012	0.0001	0.0001
				750	0.7	0.0001	0.0003	0.0000	0.0000
				1000	1.2	0.0002	0.0007	0.0000	0.0001
				1500	1.2	0.0003	0.0010	0.0000	0.0001
				2000	0.5	0.0002	0.0006	0.0000	0.0001
				3000	0.9	0.0005	0.0014	0.0001	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
			Backup Pumps	50	0.4	0.0000	0.0000	0.0000	0.0000
				120	2.4	0.0001	0.0001	0.0000	0.0000
				175	1.5	0.0001	0.0001	0.0000	0.0000
				250	1.4	0.0001	0.0002	0.0000	0.0000
				500	3.6	0.0003	0.0008	0.0000	0.0001
				750	0.5	0.0001	0.0002	0.0000	0.0000
				1000	0.8	0.0002	0.0005	0.0000	0.0000
				1500	0.8	0.0002	0.0007	0.0000	0.0001
				2000	0.4	0.0001	0.0004	0.0000	0.0000
				3000	0.6	0.0003	0.0009	0.0000	0.0001
				10000	0.0	0.0000	0.0001	0.0000	0.0000
Tuolumne County APCD Total		0	0	0	32.9	0.0097	0.0283	0.0015	0.0025
Ventura County APCD	South Central Coast	Ventura	Prime Generators	50	0.4	0.0003	0.0002	0.0000	0.0001
				120	2.7	0.0023	0.0058	0.0006	0.0008
				175	1.7	0.0022	0.0059	0.0004	0.0006
				250	1.6	0.0027	0.0082	0.0005	0.0007
				500	4.1	0.0095	0.0298	0.0016	0.0025
				750	0.5	0.0021	0.0065	0.0004	0.0006
				1000	0.9	0.0064	0.0181	0.0009	0.0016
				1500	0.9	0.0089	0.0253	0.0013	0.0023
				2000	0.4	0.0054	0.0153	0.0008	0.0014
				3000	0.6	0.0124	0.0351	0.0018	0.0032
				10000	0.0	0.0008	0.0023	0.0001	0.0002
			Prime Pumps	50	0.3	0.0002	0.0002	0.0000	0.0001
				120	1.8	0.0015	0.0038	0.0004	0.0005
				175	1.1	0.0014	0.0038	0.0002	0.0004
				250	1.1	0.0017	0.0051	0.0003	0.0005
				500	2.6	0.0063	0.0199	0.0011	0.0017
				750	0.4	0.0013	0.0042	0.0002	0.0004
				1000	0.6	0.0042	0.0118	0.0006	0.0011
				1500	0.6	0.0058	0.0165	0.0008	0.0015
				2000	0.3	0.0035	0.0100	0.0005	0.0009
				3000	0.4	0.0080	0.0228	0.0011	0.0021
				10000	0.0	0.0005	0.0015	0.0001	0.0001

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day, CO	NOx	PM	ROG
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0052	0.0128	0.0013	0.0017
				120	5.0	0.0052	0.0128	0.0013	0.0017
				120	6.0	0.0052	0.0128	0.0013	0.0017
				175	0.0	0.0015	0.0041	0.0003	0.0004
				175	1.0	0.0015	0.0041	0.0003	0.0004
				250	0.0	0.0014	0.0041	0.0002	0.0004
				250	2.0	0.0014	0.0041	0.0002	0.0004
				500	0.0	0.0073	0.0230	0.0013	0.0020
				500	1.0	0.0073	0.0230	0.0013	0.0020
				500	5.0	0.0073	0.0230	0.0013	0.0020
				750	0.0	0.0017	0.0053	0.0003	0.0005
				750	1.0	0.0017	0.0053	0.0003	0.0005
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	8.0	0.0001	0.0001	0.0000	0.0000
				120	51.7	0.0012	0.0031	0.0002	0.0004
				175	32.3	0.0011	0.0032	0.0002	0.0003
				250	31.1	0.0014	0.0045	0.0002	0.0004
				500	77.0	0.0053	0.0173	0.0008	0.0013
				750	10.2	0.0012	0.0038	0.0002	0.0003
				1000	17.3	0.0035	0.0103	0.0005	0.0008
				1500	17.3	0.0049	0.0144	0.0007	0.0[illegible]
				2000	7.5	0.0029	0.0087	0.0004	0.0[illegible]
				3000	12.2	0.0067	0.0200	0.0010	0.0010
				10000	0.4	0.0005	0.0013	0.0001	0.0001
			Backup Pumps	50	5.2	0.0001	0.0001	0.0000	0.0000
				120	33.7	0.0008	0.0020	0.0001	0.0002
				175	21.0	0.0007	0.0021	0.0001	0.0002
				250	20.2	0.0009	0.0028	0.0001	0.0002
				500	50.1	0.0036	0.0115	0.0005	0.0009
				750	6.7	0.0008	0.0024	0.0001	0.0002
				1000	11.2	0.0023	0.0067	0.0003	0.0005
				1500	11.3	0.0032	0.0094	0.0004	0.0008
				2000	4.9	0.0019	0.0057	0.0003	0.0005
				3000	7.9	0.0044	0.0130	0.0006	0.0011
				10000	0.3	0.0003	0.0009	0.0000	0.0001
Ventura County APCD Total		0	0	0	481.6	0.1815	0.5298	0.0298	0.0481
Yolo/Solano AQMD	Sacramento Valley	Solano	Prime Generators	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.4	0.0004	0.0009	0.0001	0.0001
				175	0.3	0.0003	0.0009	0.0001	0.0001
				250	0.3	0.0004	0.0013	0.0001	0.0001
				500	0.6	0.0015	0.0048	0.0003	0.0004
				750	0.1	0.0003	0.0010	0.0001	0.0001
				1000	0.1	0.0010	0.0029	0.0001	0.0003
				1500	0.1	0.0014	0.0040	0.0002	0.0004
				2000	0.1	0.0009	0.0024	0.0001	0.0002
				3000	0.1	0.0020	0.0056	0.0003	0.0005
				10000	0.0	0.0001	0.0004	0.0000	0.0000
			Prime Pumps	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.3	0.0002	0.0006	0.0001	0.0001
				175	0.2	0.0002	0.0006	0.0000	0.0001
				250	0.2	0.0003	0.0008	0.0000	0.0[illegible]
				500	0.4	0.0010	0.0032	0.0002	0.0[illegible]
				750	0.1	0.0002	0.0007	0.0000	0.0001
				1000	0.1	0.0007	0.0019	0.0001	0.0002

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day) CO	NOx	PM	ROG
				1500	0.1	0.0009	0.0026	0.0001	0.0002
				2000	0.0	0.0006	0.0016	0.0001	0.0001
				3000	0.1	0.0013	0.0036	0.0002	0.0003
				10000	0.0	0.0001	0.0002	0.0000	0.0000
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	1.3	0.0000	0.0000	0.0000	0.0000
				120	8.3	0.0002	0.0005	0.0000	0.0001
				175	5.1	0.0002	0.0005	0.0000	0.0000
				250	5.0	0.0002	0.0007	0.0000	0.0001
				500	12.3	0.0008	0.0028	0.0001	0.0002
				750	1.6	0.0002	0.0006	0.0000	0.0000
				1000	2.8	0.0006	0.0016	0.0001	0.0001
				1500	2.8	0.0008	0.0023	0.0001	0.0002
				2000	1.2	0.0005	0.0014	0.0001	0.0001
				3000	1.9	0.0011	0.0032	0.0002	0.0003
				10000	0.1	0.0001	0.0002	0.0000	0.0000
			Backup Pumps	50	0.8	0.0000	0.0000	0.0000	0.0000
				120	5.4	0.0001	0.0003	0.0000	0.0000
				175	3.4	0.0001	0.0003	0.0000	0.0000
				250	3.2	0.0001	0.0004	0.0000	0.0000
				500	8.0	0.0006	0.0018	0.0001	0.0001
				750	1.1	0.0001	0.0004	0.0000	0.0000
				1000	1.8	0.0004	0.0011	0.0001	0.0001
				1500	1.8	0.0005	0.0015	0.0001	0.0001
				2000	0.8	0.0003	0.0009	0.0000	0.0001
				3000	1.3	0.0007	0.0021	0.0001	0.0002
				10000	0.0	0.0000	0.0001	0.0000	0.0000
		Yolo	Prime Generators	50	0.1	0.0001	0.0001	0.0000	0.0000
				120	0.6	0.0005	0.0013	0.0001	0.0002
				175	0.4	0.0005	0.0013	0.0001	0.0001
				250	0.4	0.0006	0.0019	0.0001	0.0002
				500	0.9	0.0022	0.0068	0.0004	0.0006
				750	0.1	0.0005	0.0015	0.0001	0.0001
				1000	0.2	0.0015	0.0041	0.0002	0.0004
				1500	0.2	0.0020	0.0058	0.0003	0.0005
				2000	0.1	0.0012	0.0035	0.0002	0.0003
				3000	0.1	0.0028	0.0080	0.0004	0.0007
				10000	0.0	0.0002	0.0005	0.0000	0.0000
			Prime Pumps	50	0.1	0.0000	0.0000	0.0000	0.0000
				120	0.4	0.0003	0.0009	0.0001	0.0001
				175	0.3	0.0003	0.0009	0.0001	0.0001
				250	0.2	0.0004	0.0012	0.0001	0.0001
				500	0.6	0.0014	0.0045	0.0002	0.0004
				750	0.1	0.0003	0.0010	0.0001	0.0001
				1000	0.1	0.0009	0.0027	0.0001	0.0002
				1500	0.1	0.0013	0.0038	0.0002	0.0003
				2000	0.1	0.0008	0.0023	0.0001	0.0002
				3000	0.1	0.0018	0.0052	0.0003	0.0005
				10000	0.0	0.0001	0.0003	0.0000	0.0000

Attachment E

District - Air Basin - County Emissions from Stationary Diesel Engines, 2001 Base Year

Revised September 10, 2003, 2003

District	Air Basin	County	Equipment	Horsepower Class	Population	Emissions (tons/day, CO	NOx	PM	ROG
			Other	50	0.0	0.0000	0.0000	0.0000	0.0000
				120	0.0	0.0000	0.0000	0.0000	0.0000
				175	0.0	0.0000	0.0000	0.0000	0.0000
				250	0.0	0.0000	0.0000	0.0000	0.0000
				500	0.0	0.0000	0.0000	0.0000	0.0000
				750	0.0	0.0000	0.0000	0.0000	0.0000
				1000	0.0	0.0000	0.0000	0.0000	0.0000
				1500	0.0	0.0000	0.0000	0.0000	0.0000
				2000	0.0	0.0000	0.0000	0.0000	0.0000
				3000	0.0	0.0000	0.0000	0.0000	0.0000
				10000	0.0	0.0000	0.0000	0.0000	0.0000
			Backup Generators	50	1.8	0.0000	0.0000	0.0000	0.0000
				120	11.8	0.0003	0.0007	0.0001	0.0001
				175	7.4	0.0003	0.0007	0.0000	0.0001
				250	7.1	0.0003	0.0010	0.0000	0.0001
				500	17.6	0.0012	0.0039	0.0002	0.0003
				750	2.3	0.0003	0.0009	0.0000	0.0001
				1000	3.9	0.0008	0.0024	0.0001	0.0002
				1500	3.9	0.0011	0.0033	0.0002	0.0003
				2000	1.7	0.0007	0.0020	0.0001	0.0002
				3000	2.8	0.0015	0.0046	0.0002	0.0004
				10000	0.1	0.0001	0.0003	0.0000	0.0000
			Backup Pumps	50	1.2	0.0000	0.0000	0.0000	0.0000
				120	7.7	0.0002	0.0005	0.0000	0.0001
				175	4.8	0.0002	0.0005	0.0000	0.0000
				250	4.6	0.0002	0.0006	0.0000	0.00[illegible]
				500	11.4	0.0008	0.0026	0.0001	0.0[illegible]
				750	1.5	0.0002	0.0006	0.0000	0.00[illegible]
				1000	2.6	0.0005	0.0015	0.0001	0.0001
				1500	2.6	0.0007	0.0021	0.0001	0.0002
				2000	1.1	0.0004	0.0013	0.0001	0.0001
				3000	1.8	0.0010	0.0030	0.0001	0.0002
				10000	0.1	0.0001	0.0002	0.0000	0.0000
Yolo/Solano AQMD Total	0	0	0		178.4	0.0523	0.1532	0.0080	0.0134
Grand Total					20973.0	6.9056	20.2553	1.0702	1.7856

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
Amador County APCD	Mountain Counties	Amador	Air Compressors	15	0.1	0.0	0.1
				25	0.1	0.0	0.1
				50	1.0	0.1	1.1
				120	6.6	2.8	9.4
				175	0.3	1.0	1.3
				250	0.4	2.0	2.4
				500	0.3	2.8	3.1
				750	0.0	0.1	0.1
				>750	0.0	0.0	0.0
			Generator Sets	15	5.4	0.0	5.4
				25	3.9	0.0	3.9
				50	4.8	0.5	5.3
				120	7.4	3.2	10.6
				175	0.3	1.2	1.5
				250	0.3	1.9	2.3
				500	0.5	4.1	4.5
				750	0.1	1.0	1.1
				>750	0.1	1.0	1.1
			Pressure Washers	15	0.2	0.0	0.2
				25	0.1	0.0	0.1
				50	0.1	0.0	0.1
				120	0.0	0.0	0.1
			Pumps	15	4.0	0.0	4.0
				25	1.2	0.0	1.2
				50	2.1	0.2	2.3
				120	4.1	1.8	5.9
				175	0.5	1.9	2.4
				250	0.2	1.0	1.2
				500	0.4	3.3	3.6
				>750	0.0	0.2	0.2
			Welders	15	1.8	0.0	1.8
				25	1.6	0.0	1.6
				50	4.9	0.6	5.5
				120	3.8	1.6	5.5
				175	0.0	0.1	0.1
Antelope Valley APCD	Mojave Desert	Los Angeles	Air Compressors	15	0.5	0.0	0.5
				25	1.0	0.0	1.0
				50	8.4	0.9	9.4
				120	56.5	24.2	80.7
				175	2.2	8.9	11.1
				250	3.0	17.3	20.3
				500	2.7	24.2	26.9
				750	0.1	1.0	1.1
				>750	0.0	0.3	0.3

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
			Generator Sets	15	45.9	0.0	45.9
				25	33.6	0.0	33.6
				50	41.1	4.6	45.6
				120	63.5	27.2	90.7
				175	2.6	10.2	12.8
				250	2.9	16.6	19.6
				500	3.9	35.0	38.9
				750	0.9	8.4	9.3
				>750	0.9	8.4	9.3
			Pressure Washers	15	2.1	0.0	2.1
				25	0.5	0.0	0.5
				50	1.0	0.1	1.1
				120	0.4	0.1	0.5
			Pumps	15	34.5	0.0	34.5
				25	10.3	0.0	10.3
				50	18.0	2.0	19.9
				120	35.2	15.1	50.4
				175	4.0	16.2	20.2
				250	1.6	8.8	10.4
				500	3.1	28.0	31.1
				>750	0.2	1.7	1.9
			Welders	15	15.6	0.0	15.6
				25	13.7	0.0	13.7
				50	42.2	4.7	46.9
				120	32.8	14.0	46.9
				175	0.2	0.6	0.7
Bay Area AQMD	San Francisco Bay Area	Alameda	Air Compressors	15	2.2	0.0	2.2
				25	4.6	0.0	4.6
				50	40.5	4.4	44.9
				120	270.7	116.0	386.7
				175	10.6	42.4	53.0
				250	14.6	82.7	97.3
				500	12.9	115.8	128.7
				750	0.5	4.7	5.3
				>750	0.2	1.4	1.5
			Generator Sets	15	220.1	0.0	220.1
				25	161.0	0.0	161.0
				50	196.8	21.9	218.8
				120	304.4	130.3	434.7
				175	12.3	49.1	61.4
				250	14.0	79.7	93.7
				500	18.7	167.8	186.4
				750	4.4	40.1	44.5
				>750	4.4	40.1	44.5

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
			Pressure Washers	15	10.2	0.0	10.2
				25	2.4	0.0	2.4
				50	4.7	0.3	5.0
				120	1.9	0.7	2.6
			Pumps	15	165.3	0.0	165.3
				25	49.4	0.0	49.4
				50	86.0	9.4	95.4
				120	168.9	72.5	241.4
				175	19.4	77.5	96.8
				250	7.4	42.3	49.7
				500	14.9	134.3	149.3
				>750	0.9	8.4	9.3
			Welders	15	74.7	0.0	74.7
				25	65.8	0.0	65.8
				50	202.4	22.6	225.0
				120	157.2	67.3	224.5
				175	0.8	2.8	3.6
		Contra Costa	Air Compressors	15	1.5	0.0	1.5
				25	3.1	0.0	3.1
				50	26.8	2.9	29.7
				120	179.3	76.8	256.1
				175	7.0	28.1	35.1
				250	9.7	54.8	64.4
				500	8.5	76.7	85.2
				750	0.4	3.1	3.5
				>750	0.1	0.9	1.0
			Generator Sets	15	145.8	0.0	145.8
				25	106.6	0.0	106.6
				50	130.4	14.5	144.9
				120	201.6	86.3	288.0
				175	8.1	32.5	40.7
				250	9.3	52.8	62.1
				500	12.4	111.1	123.5
				750	2.9	26.6	29.5
				>750	2.9	26.6	29.5
			Pressure Washers	15	6.8	0.0	6.8
				25	1.6	0.0	1.6
				50	3.1	0.2	3.3
				120	1.3	0.4	1.7
			Pumps	15	109.5	0.0	109.5
				25	32.7	0.0	32.7
				50	57.0	6.2	63.2
				120	111.9	48.0	159.9
				175	12.8	51.3	64.1
				250	4.9	28.0	32.9

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				500	9.9	89.0	98.9
				>750	0.6	5.5	6.2
			Welders	15	49.5	0.0	49.5
				25	43.6	0.0	43.6
				50	134.1	15.0	149.0
				120	104.1	44.6	148.7
				175	0.5	1.9	2.4
		Marin	Air Compressors	15	0.4	0.0	0.4
				25	0.8	0.0	0.8
				50	6.8	0.7	7.5
				120	45.3	19.4	64.6
				175	1.8	7.1	8.9
				250	2.4	13.8	16.3
				500	2.2	19.4	21.5
				750	0.1	0.8	0.9
				>750	0.0	0.2	0.3
			Generator Sets	15	36.8	0.0	36.8
				25	26.9	0.0	26.9
				50	32.9	3.7	36.6
				120	50.9	21.8	72.7
				175	2.1	8.2	10.[illegible]
				250	2.3	13.3	15.7
				500	3.1	28.0	31.2
				750	0.7	6.7	7.5
				>750	0.7	6.7	7.5
			Pressure Washers	15	1.7	0.0	1.7
				25	0.4	0.0	0.4
				50	0.8	0.1	0.8
				120	0.3	0.1	0.4
			Pumps	15	27.6	0.0	27.6
				25	8.3	0.0	8.3
				50	14.4	1.6	16.0
				120	28.2	12.1	40.4
				175	3.2	12.9	16.2
				250	1.2	7.1	8.3
				500	2.5	22.5	25.0
				>750	0.2	1.4	1.6
			Welders	15	12.5	0.0	12.5
				25	11.0	0.0	11.0
				50	33.8	3.8	37.6
				120	26.3	11.3	37.5
				175	0.1	0.5	0.6
		Napa	Air Compressors	15	0.2	0.0	0.2
				25	0.4	0.0	0.4
				50	3.5	0.4	3.9

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				120	23.4	10.0	33.5
				175	0.9	3.7	4.6
				250	1.3	7.2	8.4
				500	1.1	10.0	11.1
				750	0.0	0.4	0.5
				>750	0.0	0.1	0.1
			Generator Sets	15	19.0	0.0	19.0
				25	13.9	0.0	13.9
				50	17.0	1.9	18.9
				120	26.3	11.3	37.6
				175	1.1	4.2	5.3
				250	1.2	6.9	8.1
				500	1.6	14.5	16.1
				750	0.4	3.5	3.9
				>750	0.4	3.5	3.9
			Pressure Washers	15	0.9	0.0	0.9
				25	0.2	0.0	0.2
				50	0.4	0.0	0.4
				120	0.2	0.1	0.2
			Pumps	15	14.3	0.0	14.3
				25	4.3	0.0	4.3
				50	7.4	0.8	8.3
				120	14.6	6.3	20.9
				175	1.7	6.7	8.4
				250	0.6	3.7	4.3
				500	1.3	11.6	12.9
				>750	0.1	0.7	0.8
			Welders	15	6.5	0.0	6.5
				25	5.7	0.0	5.7
				50	17.5	2.0	19.5
				120	13.6	5.8	19.4
				175	0.1	0.2	0.3
		San Francisco	Air Compressors	15	1.2	0.0	1.2
				25	2.4	0.0	2.4
				50	21.5	2.3	23.8
				120	143.5	61.5	205.0
				175	5.6	22.5	28.1
				250	7.7	43.8	51.6
				500	6.8	61.4	68.2
				750	0.3	2.5	2.8
				>750	0.1	0.7	0.8
			Generator Sets	15	116.7	0.0	116.7
				25	85.3	0.0	85.3
				50	104.3	11.6	116.0
				120	161.3	69.1	230.4

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				175	6.5	26.0	32.5
				250	7.4	42.2	49.7
				500	9.9	88.9	98.8
				750	2.4	21.3	23.6
				>750	2.4	21.3	23.6
			Pressure Washers	15	5.4	0.0	5.4
				25	1.3	0.0	1.3
				50	2.5	0.2	2.7
				120	1.0	0.4	1.4
			Pumps	15	87.6	0.0	87.6
				25	26.2	0.0	26.2
				50	45.6	5.0	50.6
				120	89.5	38.4	128.0
				175	10.3	41.1	51.3
				250	3.9	22.4	26.4
				500	7.9	71.2	79.1
				>750	0.5	4.4	4.9
			Welders	15	39.6	0.0	39.6
				25	34.9	0.0	34.9
				50	107.3	12.0	119.3
				120	83.3	35.7	119.0
				175	0.4	1.5	1.9
		San Mateo	Air Compressors	15	1.1	0.0	1.1
				25	2.2	0.0	2.2
				50	19.4	2.1	21.5
				120	129.7	55.6	185.2
				175	5.1	20.3	25.4
				250	7.0	39.6	46.6
				500	6.2	55.5	61.6
				750	0.3	2.3	2.5
				>750	0.1	0.6	0.7
			Generator Sets	15	105.4	0.0	105.4
				25	77.1	0.0	77.1
				50	94.3	10.5	104.8
				120	145.8	62.4	208.3
				175	5.9	23.5	29.4
				250	6.7	38.2	44.9
				500	8.9	80.4	89.3
				750	2.1	19.2	21.4
				>750	2.1	19.2	21.4
			Pressure Washers	15	4.9	0.0	4.9
				25	1.1	0.0	1.1
				50	2.3	0.2	2.4
				120	0.9	0.3	1.2
			Pumps	15	79.2	0.0	79.2

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2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				25	23.7	0.0	23.7
				50	41.2	4.5	45.7
				120	80.9	34.7	115.7
				175	9.3	37.1	46.4
				250	3.6	20.3	23.8
				500	7.2	64.4	71.5
				>750	0.5	4.0	4.5
			Welders	15	35.8	0.0	35.8
				25	31.5	0.0	31.5
				50	97.0	10.8	107.8
				120	75.3	32.3	107.6
				175	0.4	1.4	1.7
		Santa Clara	Air Compressors	15	2.6	0.0	2.6
				25	5.3	0.0	5.3
				50	46.7	5.1	51.8
				120	312.2	133.8	446.0
				175	12.2	48.9	61.1
				250	16.8	95.4	112.2
				500	14.8	133.6	148.4
				750	0.6	5.5	6.1
				>750	0.2	1.6	1.8
			Generator Sets	15	253.8	0.0	253.8
				25	185.7	0.0	185.7
				50	227.0	25.3	252.3
				120	351.1	150.3	501.4
				175	14.2	56.6	70.8
				250	16.2	91.9	108.1
				500	21.5	193.5	215.0
				750	5.1	46.3	51.4
				>750	5.1	46.3	51.4
			Pressure Washers	15	11.8	0.0	11.8
				25	2.7	0.0	2.7
				50	5.4	0.4	5.8
				120	2.2	0.8	3.0
			Pumps	15	190.6	0.0	190.6
				25	56.9	0.0	56.9
				50	99.2	10.8	110.1
				120	194.8	83.6	278.4
				175	22.3	89.3	111.7
				250	8.6	48.8	57.4
				500	17.2	155.0	172.2
				>750	1.1	9.6	10.7
			Welders	15	86.2	0.0	86.2
				25	75.9	0.0	75.9
				50	233.4	26.0	259.5
				120	181.3	77.6	259.0

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				175	0.9	3.3	4.1
		Solano	Air Compressors	15	0.4	0.0	0.4
				25	0.9	0.0	0.9
				50	7.7	0.8	8.5
				120	51.5	22.1	73.5
				175	2.0	8.1	10.1
				250	2.8	15.7	18.5
				500	2.4	22.0	24.5
				750	0.1	0.9	1.0
				>750	0.0	0.3	0.3
			Generator Sets	15	41.8	0.0	41.8
				25	30.6	0.0	30.6
				50	37.4	4.2	41.6
				120	57.9	24.8	82.7
				175	2.3	9.3	11.7
				250	2.7	15.2	17.8
				500	3.5	31.9	35.4
				750	0.8	7.6	8.5
				>750	0.8	7.6	8.5
			Pressure Washers	15	1.9	0.0	1.9
				25	0.5	0.0	0.5
				50	0.9	0.1	1.0
				120	0.4	0.1	0.5
			Pumps	15	31.4	0.0	31.4
				25	9.4	0.0	9.4
				50	16.4	1.8	18.1
				120	32.1	13.8	45.9
				175	3.7	14.7	18.4
				250	1.4	8.0	9.5
				500	2.8	25.5	28.4
				>750	0.2	1.6	1.8
			Welders	15	14.2	0.0	14.2
				25	12.5	0.0	12.5
				50	38.5	4.3	42.8
				120	29.9	12.8	42.7
				175	0.1	0.5	0.7
		Sonoma	Air Compressors	15	0.6	0.0	0.6
				25	1.3	0.0	1.3
				50	11.2	1.2	12.4
				120	74.9	32.1	106.9
				175	2.9	11.7	14.7
				250	4.0	22.9	26.9
				500	3.6	32.0	35.6
				750	0.1	1.3	1.[illegible]
				>750	0.0	0.4	0.4

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
			Generator Sets	15	60.9	0.0	60.9
				25	44.5	0.0	44.5
				50	54.4	6.1	60.5
				120	84.2	36.0	120.2
				175	3.4	13.6	17.0
				250	3.9	22.0	25.9
				500	5.2	46.4	51.5
				750	1.2	11.1	12.3
				>750	1.2	11.1	12.3
			Pressure Washers	15	2.8	0.0	2.8
				25	0.7	0.0	0.7
				50	1.3	0.1	1.4
				120	0.5	0.2	0.7
			Pumps	15	45.7	0.0	45.7
				25	13.7	0.0	13.7
				50	23.8	2.6	26.4
				120	46.7	20.1	66.8
				175	5.4	21.4	26.8
				250	2.1	11.7	13.8
				500	4.1	37.1	41.3
				>750	0.3	2.3	2.6
			Welders	15	20.7	0.0	20.7
				25	18.2	0.0	18.2
				50	56.0	6.2	62.2
				120	43.5	18.6	62.1
				175	0.2	0.8	1.0
Butte County AQMD	Sacramento Valley	Butte	Air Compressors	15	0.3	0.0	0.3
				25	0.6	0.0	0.6
				50	5.7	0.6	6.3
				120	37.9	16.3	54.2
				175	1.5	5.9	7.4
				250	2.0	11.6	13.6
				500	1.8	16.2	18.0
				750	0.1	0.7	0.7
				>750	0.0	0.2	0.2
			Generator Sets	15	30.8	0.0	30.8
				25	22.6	0.0	22.6
				50	27.6	3.1	30.7
				120	42.7	18.3	60.9
				175	1.7	6.9	8.6
				250	2.0	11.2	13.1
				500	2.6	23.5	26.1
				750	0.6	5.6	6.2
				>750	0.6	5.6	6.2

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
			Pressure Washers	15	1.4	0.0	1.4
				25	0.3	0.0	0.3
				50	0.7	0.0	0.7
				120	0.3	0.1	0.4
			Pumps	15	23.2	0.0	23.2
				25	6.9	0.0	6.9
				50	12.1	1.3	13.4
				120	23.7	10.2	33.8
				175	2.7	10.9	13.6
				250	1.0	5.9	7.0
				500	2.1	18.8	20.9
				>750	0.1	1.2	1.3
			Welders	15	10.5	0.0	10.5
				25	9.2	0.0	9.2
				50	28.4	3.2	31.5
				120	22.0	9.4	31.5
				175	0.1	0.4	0.5
Calaveras County AQMD	Mountain Counties	Calaveras	Air Compressors	15	0.1	0.0	0.1
				25	0.1	0.0	0.1
				50	1.1	0.1	1.3
				120	7.7	3.3	11.0
				175	0.3	1.2	1.5
				250	0.4	2.3	2.8
				500	0.4	3.3	3.6
				750	0.0	0.1	0.1
				>750	0.0	0.0	0.0
			Generator Sets	15	6.2	0.0	6.2
				25	4.6	0.0	4.6
				50	5.6	0.6	6.2
				120	8.6	3.7	12.3
				175	0.3	1.4	1.7
				250	0.4	2.3	2.7
				500	0.5	4.8	5.3
				750	0.1	1.1	1.3
				>750	0.1	1.1	1.3
			Pressure Washers	15	0.3	0.0	0.3
				25	0.1	0.0	0.1
				50	0.1	0.0	0.1
				120	0.1	0.0	0.1
			Pumps	15	4.7	0.0	4.7
				25	1.4	0.0	1.4
				50	2.4	0.3	2.7
				120	4.8	2.1	6.8
				175	0.5	2.2	2.7
				250	0.2	1.2	1.4

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2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				500	0.4	3.8	4.2
				>750	0.0	0.2	0.3
			Welders	15	2.1	0.0	2.1
				25	1.9	0.0	1.9
				50	5.7	0.6	6.4
				120	4.5	1.9	6.4
				175	0.0	0.1	0.1
Colusa County APCD	Sacramento Valley	Colusa	Air Compressors	15	0.0	0.0	0.0
				25	0.1	0.0	0.1
				50	0.5	0.1	0.6
				120	3.6	1.5	5.1
				175	0.1	0.6	0.7
				250	0.2	1.1	1.3
				500	0.2	1.5	1.7
				750	0.0	0.1	0.1
				>750	0.0	0.0	0.0
			Generator Sets	15	2.9	0.0	2.9
				25	2.1	0.0	2.1
				50	2.6	0.3	2.9
				120	4.0	1.7	5.7
				175	0.2	0.6	0.8
				250	0.2	1.0	1.2
				500	0.2	2.2	2.4
				750	0.1	0.5	0.6
				>750	0.1	0.5	0.6
			Pressure Washers	15	0.1	0.0	0.1
				25	0.0	0.0	0.0
				50	0.1	0.0	0.1
				120	0.0	0.0	0.0
			Pumps	15	2.2	0.0	2.2
				25	0.6	0.0	0.6
				50	1.1	0.1	1.3
				120	2.2	1.0	3.2
				175	0.3	1.0	1.3
				250	0.1	0.6	0.7
				500	0.2	1.8	2.0
				>750	0.0	0.1	0.1
			Welders	15	1.0	0.0	1.0
				25	0.9	0.0	0.9
				50	2.7	0.3	3.0
				120	2.1	0.9	2.9
				175	0.0	0.0	0.0
El Dorado County APCD	Lake Tahoe	El Dorado	Air Compressors	15	0.1	0.0	0.1
				25	0.1	0.0	0.1
				50	1.0	0.1	1.1

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				120	6.5	2.8	9.3
				175	0.3	1.0	1.3
				250	0.4	2.0	2.3
				500	0.3	2.8	3.1
				750	0.0	0.1	0.1
				>750	0.0	0.0	0.0
			Generator Sets	15	5.3	0.0	5.3
				25	3.9	0.0	3.9
				50	4.8	0.5	5.3
				120	7.4	3.1	10.5
				175	0.3	1.2	1.5
				250	0.3	1.9	2.3
				500	0.5	4.1	4.5
				750	0.1	1.0	1.1
				>750	0.1	1.0	1.1
			Pressure Washers	15	0.2	0.0	0.2
				25	0.1	0.0	0.1
				50	0.1	0.0	0.1
				120	0.0	0.0	0.1
			Pumps	15	4.0	0.0	4.0
				25	1.2	0.0	1.2
				50	2.1	0.2	2.3
				120	4.1	1.8	5.8
				175	0.5	1.9	2.3
				250	0.2	1.0	1.2
				500	0.4	3.2	3.6
				>750	0.0	0.2	0.2
			Welders	15	1.8	0.0	1.8
				25	1.6	0.0	1.6
				50	4.9	0.5	5.4
				120	3.8	1.6	5.4
				175	0.0	0.1	0.1
	Mountain Counties		Air Compressors	15	0.2	0.0	0.2
				25	0.4	0.0	0.4
				50	3.5	0.4	3.9
				120	23.5	10.1	33.5
				175	0.9	3.7	4.6
				250	1.3	7.2	8.4
				500	1.1	10.0	11.2
				750	0.0	0.4	0.5
				>750	0.0	0.1	0.1
			Generator Sets	15	19.1	0.0	19.1
				25	14.0	0.0	14.0
				50	17.1	1.9	19.[illegible]
				120	26.4	11.3	37.7

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				175	1.1	4.3	5.3
				250	1.2	6.9	8.1
				500	1.6	14.5	16.2
				750	0.4	3.5	3.9
				>750	0.4	3.5	3.9
			Pressure Washers	15	0.9	0.0	0.9
				25	0.2	0.0	0.2
				50	0.4	0.0	0.4
				120	0.2	0.1	0.2
			Pumps	15	14.3	0.0	14.3
				25	4.3	0.0	4.3
				50	7.5	0.8	8.3
				120	14.6	6.3	20.9
				175	1.7	6.7	8.4
				250	0.6	3.7	4.3
				500	1.3	11.6	12.9
				>750	0.1	0.7	0.8
			Welders	15	6.5	0.0	6.5
				25	5.7	0.0	5.7
				50	17.6	2.0	19.5
				120	13.6	5.8	19.5
				175	0.1	0.2	0.3
Feather River AQMD	Sacramento Valley	Sutter	Air Compressors	15	0.1	0.0	0.1
				25	0.3	0.0	0.3
				50	2.2	0.2	2.5
				120	15.0	6.4	21.4
				175	0.6	2.3	2.9
				250	0.8	4.6	5.4
				500	0.7	6.4	7.1
				750	0.0	0.3	0.3
				>750	0.0	0.1	0.1
			Generator Sets	15	12.2	0.0	12.2
				25	8.9	0.0	8.9
				50	10.9	1.2	12.1
				120	16.9	7.2	24.1
				175	0.7	2.7	3.4
				250	0.8	4.4	5.2
				500	1.0	9.3	10.3
				750	0.2	2.2	2.5
				>750	0.2	2.2	2.5
			Pressure Washers	15	0.6	0.0	0.6
				25	0.1	0.0	0.1
				50	0.3	0.0	0.3
				120	0.1	0.0	0.1
			Pumps	15	9.2	0.0	9.2

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				25	2.7	0.0	2.7
				50	4.8	0.5	5.3
				120	9.4	4.0	13.4
				175	1.1	4.3	5.4
				250	0.4	2.3	2.8
				500	0.8	7.4	8.3
				>750	0.1	0.5	0.5
			Welders	15	4.1	0.0	4.1
				25	3.6	0.0	3.6
				50	11.2	1.3	12.5
				120	8.7	3.7	12.4
				175	0.0	0.2	0.2
		Yuba	Air Compressors	15	0.1	0.0	0.1
				25	0.2	0.0	0.2
				50	1.7	0.2	1.9
				120	11.3	4.9	16.2
				175	0.4	1.8	2.2
				250	0.6	3.5	4.1
				500	0.5	4.9	5.4
				750	0.0	0.2	0.2
				>750	0.0	0.1	0.1
			Generator Sets	15	9.2	0.0	9.2
				25	6.7	0.0	6.7
				50	8.2	0.9	9.2
				120	12.7	5.5	18.2
				175	0.5	2.1	2.6
				250	0.6	3.3	3.9
				500	0.8	7.0	7.8
				750	0.2	1.7	1.9
				>750	0.2	1.7	1.9
			Pressure Washers	15	0.4	0.0	0.4
				25	0.1	0.0	0.1
				50	0.2	0.0	0.2
				120	0.1	0.0	0.1
			Pumps	15	6.9	0.0	6.9
				25	2.1	0.0	2.1
				50	3.6	0.4	4.0
				120	7.1	3.0	10.1
				175	0.8	3.2	4.1
				250	0.3	1.8	2.1
				500	0.6	5.6	6.3
				>750	0.0	0.3	0.4
			Welders	15	3.1	0.0	3.1
				25	2.8	0.0	2.8
				50	8.5	0.9	9.4
				120	6.6	2.8	9.4

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				175	0.0	0.1	0.2
Glenn County APCD		Glenn	Air Compressors	15	0.0	0.0	0.0
				25	0.1	0.0	0.1
				50	0.7	0.1	0.8
				120	4.9	2.1	7.0
				175	0.2	0.8	1.0
				250	0.3	1.5	1.8
				500	0.2	2.1	2.3
				750	0.0	0.1	0.1
				>750	0.0	0.0	0.0
			Generator Sets	15	4.0	0.0	4.0
				25	2.9	0.0	2.9
				50	3.5	0.4	3.9
				120	5.5	2.3	7.8
				175	0.2	0.9	1.1
				250	0.3	1.4	1.7
				500	0.3	3.0	3.4
				750	0.1	0.7	0.8
				>750	0.1	0.7	0.8
			Pressure Washers	15	0.2	0.0	0.2
				25	0.0	0.0	0.0
				50	0.1	0.0	0.1
				120	0.0	0.0	0.0
			Pumps	15	3.0	0.0	3.0
				25	0.9	0.0	0.9
				50	1.6	0.2	1.7
				120	3.0	1.3	4.4
				175	0.3	1.4	1.7
				250	0.1	0.8	0.9
				500	0.3	2.4	2.7
				>750	0.0	0.2	0.2
			Welders	15	1.3	0.0	1.3
				25	1.2	0.0	1.2
				50	3.6	0.4	4.1
				120	2.8	1.2	4.0
				175	0.0	0.1	0.1
Great Basin Unified APCD	Great Basin Valleys	Alpine	Air Compressors	15	0.0	0.0	0.0
				25	0.0	0.0	0.0
				50	0.0	0.0	0.0
				120	0.2	0.1	0.3
				175	0.0	0.0	0.0
				250	0.0	0.1	0.1
				500	0.0	0.1	0.1
				750	0.0	0.0	0.0
				>750	0.0	0.0	0.0

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
			Generator Sets	15	0.2	0.0	0.2
				25	0.1	0.0	0.1
				50	0.2	0.0	0.2
				120	0.3	0.1	0.4
				175	0.0	0.0	0.1
				250	0.0	0.1	0.1
				500	0.0	0.1	0.2
				750	0.0	0.0	0.0
				>750	0.0	0.0	0.0
			Pressure Washers	15	0.0	0.0	0.0
				25	0.0	0.0	0.0
				50	0.0	0.0	0.0
				120	0.0	0.0	0.0
			Pumps	15	0.1	0.0	0.1
				25	0.0	0.0	0.0
				50	0.1	0.0	0.1
				120	0.1	0.1	0.2
				175	0.0	0.1	0.1
				250	0.0	0.0	0.0
				500	0.0	0.1	0.1
				>750	0.0	0.0	0.0
			Welders	15	0.1	0.0	0.1
				25	0.1	0.0	0.1
				50	0.2	0.0	0.2
				120	0.1	0.1	0.2
				175	0.0	0.0	0.0
		Inyo	Air Compressors	15	0.0	0.0	0.0
				25	0.1	0.0	0.1
				50	0.5	0.1	0.5
				120	3.3	1.4	4.7
				175	0.1	0.5	0.6
				250	0.2	1.0	1.2
				500	0.2	1.4	1.6
				750	0.0	0.1	0.1
				>750	0.0	0.0	0.0
			Generator Sets	15	2.7	0.0	2.7
				25	2.0	0.0	2.0
				50	2.4	0.3	2.7
				120	3.7	1.6	5.3
				175	0.2	0.6	0.8
				250	0.2	1.0	1.1
				500	0.2	2.1	2.3
				750	0.1	0.5	0.5
				>750	0.1	0.5	0.5

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
			Pressure Washers	15	0.1	0.0	0.1
				25	0.0	0.0	0.0
				50	0.1	0.0	0.1
				120	0.0	0.0	0.0
			Pumps	15	2.0	0.0	2.0
				25	0.6	0.0	0.6
				50	1.1	0.1	1.2
				120	2.1	0.9	3.0
				175	0.2	0.9	1.2
				250	0.1	0.5	0.6
				500	0.2	1.6	1.8
				>750	0.0	0.1	0.1
			Welders	15	0.9	0.0	0.9
				25	0.8	0.0	0.8
				50	2.5	0.3	2.8
				120	1.9	0.8	2.8
				175	0.0	0.0	0.0
		Mono	Air Compressors	15	0.0	0.0	0.0
				25	0.0	0.0	0.0
				50	0.4	0.0	0.4
				120	2.4	1.0	3.5
				175	0.1	0.4	0.5
				250	0.1	0.7	0.9
				500	0.1	1.0	1.2
				750	0.0	0.0	0.0
				>750	0.0	0.0	0.0
			Generator Sets	15	2.0	0.0	2.0
				25	1.4	0.0	1.4
				50	1.8	0.2	2.0
				120	2.7	1.2	3.9
				175	0.1	0.4	0.5
				250	0.1	0.7	0.8
				500	0.2	1.5	1.7
				750	0.0	0.4	0.4
				>750	0.0	0.4	0.4
			Pressure Washers	15	0.1	0.0	0.1
				25	0.0	0.0	0.0
				50	0.0	0.0	0.0
				120	0.0	0.0	0.0
			Pumps	15	1.5	0.0	1.5
				25	0.4	0.0	0.4
				50	0.8	0.1	0.9
				120	1.5	0.6	2.2
				175	0.2	0.7	0.9
				250	0.1	0.4	0.4

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				500	0.1	1.2	1.3
				>750	0.0	0.1	0.1
			Welders	15	0.7	0.0	0.7
				25	0.6	0.0	0.6
				50	1.8	0.2	2.0
				120	1.4	0.6	2.0
				175	0.0	0.0	0.0
Imperial County APCD	Salton Sea	Imperial	Air Compressors	15	0.2	0.0	0.2
				25	0.5	0.0	0.5
				50	4.1	0.4	4.6
				120	27.6	11.8	39.4
				175	1.1	4.3	5.4
				250	1.5	8.4	9.9
				500	1.3	11.8	13.1
				750	0.1	0.5	0.5
				>750	0.0	0.1	0.2
			Generator Sets	15	22.4	0.0	22.4
				25	16.4	0.0	16.4
				50	20.1	2.2	22.3
				120	31.0	13.3	44.3
				175	1.3	5.0	6.3
				250	1.4	8.1	9.6
				500	1.9	17.1	19.0
				750	0.5	4.1	4.5
				>750	0.5	4.1	4.5
			Pressure Washers	15	1.0	0.0	1.0
				25	0.2	0.0	0.2
				50	0.5	0.0	0.5
				120	0.2	0.1	0.3
			Pumps	15	16.8	0.0	16.8
				25	5.0	0.0	5.0
				50	8.8	1.0	9.7
				120	17.2	7.4	24.6
				175	2.0	7.9	9.9
				250	0.8	4.3	5.1
				500	1.5	13.7	15.2
				>750	0.1	0.9	0.9
			Welders	15	7.6	0.0	7.6
				25	6.7	0.0	6.7
				50	20.6	2.3	22.9
				120	16.0	6.9	22.9
				175	0.1	0.3	0.4
Kern County APCD	Mojave Desert	Kern	Air Compressors	15	0.2	0.0	0.2
				25	0.4	0.0	0.4
				50	3.2	0.3	3.6

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				120	21.5	9.2	30.7
				175	0.8	3.4	4.2
				250	1.2	6.6	7.7
				500	1.0	9.2	10.2
				750	0.0	0.4	0.4
				>750	0.0	0.1	0.1
			Generator Sets	15	17.5	0.0	17.5
				25	12.8	0.0	12.8
				50	15.6	1.7	17.4
				120	24.1	10.3	34.5
				175	1.0	3.9	4.9
				250	1.1	6.3	7.4
				500	1.5	13.3	14.8
				750	0.4	3.2	3.5
				>750	0.4	3.2	3.5
			Pressure Washers	15	0.8	0.0	0.8
				25	0.2	0.0	0.2
				50	0.4	0.0	0.4
				120	0.2	0.1	0.2
			Pumps	15	13.1	0.0	13.1
				25	3.9	0.0	3.9
				50	6.8	0.7	7.6
				120	13.4	5.8	19.2
				175	1.5	6.1	7.7
				250	0.6	3.4	3.9
				500	1.2	10.7	11.8
				>750	0.1	0.7	0.7
			Welders	15	5.9	0.0	5.9
				25	5.2	0.0	5.2
				50	16.1	1.8	17.8
				120	12.5	5.3	17.8
				175	0.1	0.2	0.3
Lake County AQMD	Lake County	Lake	Air Compressors	15	0.1	0.0	0.1
				25	0.2	0.0	0.2
				50	1.7	0.2	1.8
				120	11.1	4.8	15.9
				175	0.4	1.7	2.2
				250	0.6	3.4	4.0
				500	0.5	4.7	5.3
				750	0.0	0.2	0.2
				>750	0.0	0.1	0.1
			Generator Sets	15	9.0	0.0	9.0
				25	6.6	0.0	6.6
				50	8.1	0.9	9.0
				120	12.5	5.3	17.8

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				175	0.5	2.0	2.5
				250	0.6	3.3	3.8
				500	0.8	6.9	7.6
				750	0.2	1.6	1.8
				>750	0.2	1.6	1.8
			Pressure Washers	15	0.4	0.0	0.4
				25	0.1	0.0	0.1
				50	0.2	0.0	0.2
				120	0.1	0.0	0.1
			Pumps	15	6.8	0.0	6.8
				25	2.0	0.0	2.0
				50	3.5	0.4	3.9
				120	6.9	3.0	9.9
				175	0.8	3.2	4.0
				250	0.3	1.7	2.0
				500	0.6	5.5	6.1
				>750	0.0	0.3	0.4
			Welders	15	3.1	0.0	3.1
				25	2.7	0.0	2.7
				50	8.3	0.9	9.2
				120	6.4	2.8	9.2
				175	0.0	0.1	0.1
Lassen County APCD	Northeast Plateau	Lassen	Air Compressors	15	0.1	0.0	0.1
				25	0.1	0.0	0.1
				50	0.9	0.1	1.0
				120	6.2	2.7	8.9
				175	0.2	1.0	1.2
				250	0.3	1.9	2.2
				500	0.3	2.7	2.9
				750	0.0	0.1	0.1
				>750	0.0	0.0	0.0
			Generator Sets	15	5.0	0.0	5.0
				25	3.7	0.0	3.7
				50	4.5	0.5	5.0
				120	7.0	3.0	10.0
				175	0.3	1.1	1.4
				250	0.3	1.8	2.1
				500	0.4	3.8	4.3
				750	0.1	0.9	1.0
				>750	0.1	0.9	1.0
			Pressure Washers	15	0.2	0.0	0.2
				25	0.1	0.0	0.1
				50	0.1	0.0	0.1
				120	0.0	0.0	0.1
			Pumps	15	3.8	0.0	3.8

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				25	1.1	0.0	1.1
				50	2.0	0.2	2.2
				120	3.9	1.7	5.5
				175	0.4	1.8	2.2
				250	0.2	1.0	1.1
				500	0.3	3.1	3.4
				>750	0.0	0.2	0.2
			Welders	15	1.7	0.0	1.7
				25	1.5	0.0	1.5
				50	4.6	0.5	5.2
				120	3.6	1.5	5.1
				175	0.0	0.1	0.1
Mariposa County APCD	Mountain Counties	Mariposa	Air Compressors	15	0.0	0.0	0.0
				25	0.1	0.0	0.1
				50	0.5	0.1	0.5
				120	3.2	1.4	4.5
				175	0.1	0.5	0.6
				250	0.2	1.0	1.1
				500	0.2	1.4	1.5
				750	0.0	0.1	0.1
				>750	0.0	0.0	0.0
			Generator Sets	15	2.6	0.0	2.6
				25	1.9	0.0	1.9
				50	2.3	0.3	2.6
				120	3.6	1.5	5.1
				175	0.1	0.6	0.7
				250	0.2	0.9	1.1
				500	0.2	2.0	2.2
				750	0.1	0.5	0.5
				>750	0.1	0.5	0.5
			Pressure Washers	15	0.1	0.0	0.1
				25	0.0	0.0	0.0
				50	0.1	0.0	0.1
				120	0.0	0.0	0.0
			Pumps	15	1.9	0.0	1.9
				25	0.6	0.0	0.6
				50	1.0	0.1	1.1
				120	2.0	0.8	2.8
				175	0.2	0.9	1.1
				250	0.1	0.5	0.6
				500	0.2	1.6	1.7
				>750	0.0	0.1	0.1
			Welders	15	0.9	0.0	0.9
				25	0.8	0.0	0.8
				50	2.4	0.3	2.6
				120	1.8	0.8	2.6

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				175	0.0	0.0	0.0
Mendocino County AQMD	North Coast	Mendocino	Air Compressors	15	0.1	0.0	0.1
				25	0.3	0.0	0.3
				50	2.4	0.3	2.6
				120	16.0	6.8	22.8
				175	0.6	2.5	3.1
				250	0.9	4.9	5.7
				500	0.8	6.8	7.6
				750	0.0	0.3	0.3
				>750	0.0	0.1	0.1
			Generator Sets	15	13.0	0.0	13.0
				25	9.5	0.0	9.5
				50	11.6	1.3	12.9
				120	18.0	7.7	25.6
				175	0.7	2.9	3.6
				250	0.8	4.7	5.5
				500	1.1	9.9	11.0
				750	0.3	2.4	2.6
				>750	0.3	2.4	2.6
			Pressure Washers	15	0.6	0.0	0.6
				25	0.1	0.0	0.1
				50	0.3	0.0	0.3
				120	0.1	0.0	0.2
			Pumps	15	9.8	0.0	9.8
				25	2.9	0.0	2.9
				50	5.1	0.6	5.6
				120	10.0	4.3	14.2
				175	1.1	4.6	5.7
				250	0.4	2.5	2.9
				500	0.9	7.9	8.8
				>750	0.1	0.5	0.5
			Welders	15	4.4	0.0	4.4
				25	3.9	0.0	3.9
				50	11.9	1.3	13.3
				120	9.3	4.0	13.2
				175	0.0	0.2	0.2
Modoc County APCD	Northeast Plateau	Modoc	Air Compressors	15	0.0	0.0	0.0
				25	0.0	0.0	0.0
				50	0.3	0.0	0.3
				120	1.7	0.7	2.4
				175	0.1	0.3	0.3
				250	0.1	0.5	0.6
				500	0.1	0.7	0.8
				750	0.0	0.0	0.0
				>750	0.0	0.0	0.0

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
			Generator Sets	15	1.4	0.0	1.4
				25	1.0	0.0	1.0
				50	1.2	0.1	1.4
				120	1.9	0.8	2.7
				175	0.1	0.3	0.4
				250	0.1	0.5	0.6
				500	0.1	1.0	1.2
				750	0.0	0.3	0.3
				>750	0.0	0.3	0.3
			Pressure Washers	15	0.1	0.0	0.1
				25	0.0	0.0	0.0
				50	0.0	0.0	0.0
				120	0.0	0.0	0.0
			Pumps	15	1.0	0.0	1.0
				25	0.3	0.0	0.3
				50	0.5	0.1	0.6
				120	1.1	0.5	1.5
				175	0.1	0.5	0.6
				250	0.0	0.3	0.3
				500	0.1	0.8	0.9
				>750	0.0	0.1	0.1
			Welders	15	0.5	0.0	0.5
				25	0.4	0.0	0.4
				50	1.3	0.1	1.4
				120	1.0	0.4	1.4
				175	0.0	0.0	0.0
Mojave Desert AQMD	Mojave Desert	Riverside	Air Compressors	15	0.0	0.0	0.0
				25	0.1	0.0	0.1
				50	0.5	0.1	0.5
				120	3.2	1.4	4.6
				175	0.1	0.5	0.6
				250	0.2	1.0	1.2
				500	0.2	1.4	1.5
				750	0.0	0.1	0.1
				>750	0.0	0.0	0.0
			Generator Sets	15	2.6	0.0	2.6
				25	1.9	0.0	1.9
				50	2.4	0.3	2.6
				120	3.6	1.6	5.2
				175	0.1	0.6	0.7
				250	0.2	1.0	1.1
				500	0.2	2.0	2.2
				750	0.1	0.5	0.5
				>750	0.1	0.5	0.5

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
			Pressure Washers	15	0.1	0.0	0.1
				25	0.0	0.0	0.0
				50	0.1	0.0	0.1
				120	0.0	0.0	0.0
			Pumps	15	2.0	0.0	2.0
				25	0.6	0.0	0.6
				50	1.0	0.1	1.1
				120	2.0	0.9	2.9
				175	0.2	0.9	1.2
				250	0.1	0.5	0.6
				500	0.2	1.6	1.8
				>750	0.0	0.1	0.1
			Welders	15	0.9	0.0	0.9
				25	0.8	0.0	0.8
				50	2.4	0.3	2.7
				120	1.9	0.8	2.7
				175	0.0	0.0	0.0
		San Bernardino	Air Compressors	15	0.6	0.0	0.6
				25	1.2	0.0	1.2
				50	10.9	1.2	12.1
				120	73.2	31.3	104.
				175	2.9	11.5	14.3
				250	3.9	22.3	26.3
				500	3.5	31.3	34.8
				750	0.1	1.3	1.4
				>750	0.0	0.4	0.4
			Generator Sets	15	59.5	0.0	59.5
				25	43.5	0.0	43.5
				50	53.2	5.9	59.1
				120	82.3	35.2	117.5
				175	3.3	13.3	16.6
				250	3.8	21.5	25.3
				500	5.0	45.3	50.4
				750	1.2	10.8	12.0
				>750	1.2	10.8	12.0
			Pressure Washers	15	2.8	0.0	2.8
				25	0.6	0.0	0.6
				50	1.3	0.1	1.4
				120	0.5	0.2	0.7
			Pumps	15	44.7	0.0	44.7
				25	13.3	0.0	13.3
				50	23.3	2.5	25.8
				120	45.7	19.6	65.2
				175	5.2	20.9	26.2
				250	2.0	11.4	13.4

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				500	4.0	36.3	40.3
				>750	0.3	2.3	2.5
			Welders	15	20.2	0.0	20.2
				25	17.8	0.0	17.8
				50	54.7	6.1	60.8
				120	42.5	18.2	60.7
				175	0.2	0.8	1.0
Monterey Bay Unified APCD	North Central Coast	Monterey	Air Compressors	15	0.6	0.0	0.6
				25	1.3	0.0	1.3
				50	11.2	1.2	12.4
				120	74.9	32.1	106.9
				175	2.9	11.7	14.7
				250	4.0	22.9	26.9
				500	3.6	32.0	35.6
				750	0.1	1.3	1.5
				>750	0.0	0.4	0.4
			Generator Sets	15	60.9	0.0	60.9
				25	44.5	0.0	44.5
				50	54.4	6.1	60.5
				120	84.2	36.0	120.2
				175	3.4	13.6	17.0
				250	3.9	22.0	25.9
				500	5.2	46.4	51.5
				750	1.2	11.1	12.3
				>750	1.2	11.1	12.3
			Pressure Washers	15	2.8	0.0	2.8
				25	0.7	0.0	0.7
				50	1.3	0.1	1.4
				120	0.5	0.2	0.7
			Pumps	15	45.7	0.0	45.7
				25	13.7	0.0	13.7
				50	23.8	2.6	26.4
				120	46.7	20.1	66.8
				175	5.4	21.4	26.8
				250	2.1	11.7	13.8
				500	4.1	37.1	41.3
				>750	0.3	2.3	2.6
			Welders	15	20.7	0.0	20.7
				25	18.2	0.0	18.2
				50	56.0	6.2	62.2
				120	43.5	18.6	62.1
				175	0.2	0.8	1.0
		San Benito	Air Compressors	15	0.1	0.0	0.1
				25	0.2	0.0	0.2
				50	1.5	0.2	1.7

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2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				120	10.2	4.4	14.5
				175	0.4	1.6	2.0
				250	0.5	3.1	3.7
				500	0.5	4.4	4.8
				750	0.0	0.2	0.2
				>750	0.0	0.1	0.1
			Generator Sets	15	8.3	0.0	8.3
				25	6.1	0.0	6.1
				50	7.4	0.8	8.2
				120	11.4	4.9	16.3
				175	0.5	1.8	2.3
				250	0.5	3.0	3.5
				500	0.7	6.3	7.0
				750	0.2	1.5	1.7
				>750	0.2	1.5	1.7
			Pressure Washers	15	0.4	0.0	0.4
				25	0.1	0.0	0.1
				50	0.2	0.0	0.2
				120	0.1	0.0	0.1
			Pumps	15	6.2	0.0	6.2
				25	1.9	0.0	1.9
				50	3.2	0.4	3.6
				120	6.3	2.7	9.1
				175	0.7	2.9	3.6
				250	0.3	1.6	1.9
				500	0.6	5.0	5.6
				>750	0.0	0.3	0.3
			Welders	15	2.8	0.0	2.8
				25	2.5	0.0	2.5
				50	7.6	0.8	8.5
				120	5.9	2.5	8.4
				175	0.0	0.1	0.1
		Santa Cruz	Air Compressors	15	0.4	0.0	0.4
				25	0.8	0.0	0.8
				50	7.0	0.8	7.8
				120	47.1	20.2	67.2
				175	1.8	7.4	9.2
				250	2.5	14.4	16.9
				500	2.2	20.1	22.4
				750	0.1	0.8	0.9
				>750	0.0	0.2	0.3
			Generator Sets	15	38.3	0.0	38.3
				25	28.0	0.0	28.0
				50	34.2	3.8	38.0
				120	52.9	22.7	75.6

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				175	2.1	8.5	10.7
				250	2.4	13.9	16.3
				500	3.2	29.2	32.4
				750	0.8	7.0	7.7
				>750	0.8	7.0	7.7
			Pressure Washers	15	1.8	0.0	1.8
				25	0.4	0.0	0.4
				50	0.8	0.1	0.9
				120	0.3	0.1	0.5
			Pumps	15	28.7	0.0	28.7
				25	8.6	0.0	8.6
				50	15.0	1.6	16.6
				120	29.4	12.6	42.0
				175	3.4	13.5	16.8
				250	1.3	7.4	8.6
				500	2.6	23.4	25.9
				>750	0.2	1.5	1.6
			Welders	15	13.0	0.0	13.0
				25	11.4	0.0	11.4
				50	35.2	3.9	39.1
				120	27.3	11.7	39.0
				175	0.1	0.5	0.6
North Coast Unified APCD	North Coast	Del Norte	Air Compressors	15	0.0	0.0	0.0
				25	0.1	0.0	0.1
				50	0.8	0.1	0.8
				120	5.1	2.2	7.2
				175	0.2	0.8	1.0
				250	0.3	1.5	1.8
				500	0.2	2.2	2.4
				750	0.0	0.1	0.1
				>750	0.0	0.0	0.0
			Generator Sets	15	4.1	0.0	4.1
				25	3.0	0.0	3.0
				50	3.7	0.4	4.1
				120	5.7	2.4	8.1
				175	0.2	0.9	1.1
				250	0.3	1.5	1.8
				500	0.3	3.1	3.5
				750	0.1	0.8	0.8
				>750	0.1	0.8	0.8
			Pressure Washers	15	0.2	0.0	0.2
				25	0.0	0.0	0.0
				50	0.1	0.0	0.1
				120	0.0	0.0	0.0
			Pumps	15	3.1	0.0	3.1

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				25	0.9	0.0	0.9
				50	1.6	0.2	1.8
				120	3.2	1.4	4.5
				175	0.4	1.4	1.8
				250	0.1	0.8	0.9
				500	0.3	2.5	2.8
				>750	0.0	0.2	0.2
			Welders	15	1.4	0.0	1.4
				25	1.2	0.0	1.2
				50	3.8	0.4	4.2
				120	2.9	1.3	4.2
				175	0.0	0.1	0.1
		Humboldt	Air Compressors	15	0.2	0.0	0.2
				25	0.4	0.0	0.4
				50	3.5	0.4	3.8
				120	23.2	9.9	33.1
				175	0.9	3.6	4.5
				250	1.2	7.1	8.3
				500	1.1	9.9	11.0
				750	0.0	0.4	0.5
				>750	0.0	0.1	0.1
			Generator Sets	15	18.8	0.0	18.8
				25	13.8	0.0	13.8
				50	16.8	1.9	18.7
				120	26.0	11.2	37.2
				175	1.1	4.2	5.3
				250	1.2	6.8	8.0
				500	1.6	14.4	16.0
				750	0.4	3.4	3.8
				>750	0.4	3.4	3.8
			Pressure Washers	15	0.9	0.0	0.9
				25	0.2	0.0	0.2
				50	0.4	0.0	0.4
				120	0.2	0.1	0.2
			Pumps	15	14.1	0.0	14.1
				25	4.2	0.0	4.2
				50	7.4	0.8	8.2
				120	14.5	6.2	20.7
				175	1.7	6.6	8.3
				250	0.6	3.6	4.3
				500	1.3	11.5	12.8
				>750	0.1	0.7	0.8
			Welders	15	6.4	0.0	6.4
				25	5.6	0.0	5.6
				50	17.3	1.9	19.3
				120	13.5	5.8	19.2

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				175	0.1	0.2	0.3
		Trinity	Air Compressors	15	0.0	0.0	0.0
				25	0.0	0.0	0.0
				50	0.4	0.0	0.4
				120	2.4	1.0	3.4
				175	0.1	0.4	0.5
				250	0.1	0.7	0.9
				500	0.1	1.0	1.1
				750	0.0	0.0	0.0
				>750	0.0	0.0	0.0
			Generator Sets	15	1.9	0.0	1.9
				25	1.4	0.0	1.4
				50	1.7	0.2	1.9
				120	2.7	1.1	3.8
				175	0.1	0.4	0.5
				250	0.1	0.7	0.8
				500	0.2	1.5	1.6
				750	0.0	0.4	0.4
				>750	0.0	0.4	0.4
			Pressure Washers	15	0.1	0.0	0.1
				25	0.0	0.0	0.0
				50	0.0	0.0	0.0
				120	0.0	0.0	0.0
			Pumps	15	1.5	0.0	1.5
				25	0.4	0.0	0.4
				50	0.8	0.1	0.8
				120	1.5	0.6	2.1
				175	0.2	0.7	0.9
				250	0.1	0.4	0.4
				500	0.1	1.2	1.3
				>750	0.0	0.1	0.1
			Welders	15	0.7	0.0	0.7
				25	0.6	0.0	0.6
				50	1.8	0.2	2.0
				120	1.4	0.6	2.0
				175	0.0	0.0	0.0
Northern Sierra AQMD	Mountain Counties	Nevada	Air Compressors	15	0.1	0.0	0.1
				25	0.3	0.0	0.3
				50	2.6	0.3	2.9
				120	17.4	7.4	24.8
				175	0.7	2.7	3.4
				250	0.9	5.3	6.2
				500	0.8	7.4	8.3
				750	0.0	0.3	0.3
				>750	0.0	0.1	0.1

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
			Generator Sets	15	14.1	0.0	14.1
				25	10.3	0.0	10.3
				50	12.6	1.4	14.0
				120	19.5	8.4	27.9
				175	0.8	3.2	3.9
				250	0.9	5.1	6.0
				500	1.2	10.8	12.0
				750	0.3	2.6	2.9
				>750	0.3	2.6	2.9
			Pressure Washers	15	0.7	0.0	0.7
				25	0.2	0.0	0.2
				50	0.3	0.0	0.3
				120	0.1	0.0	0.2
			Pumps	15	10.6	0.0	10.6
				25	3.2	0.0	3.2
				50	5.5	0.6	6.1
				120	10.8	4.7	15.5
				175	1.2	5.0	6.2
				250	0.5	2.7	3.2
				500	1.0	8.6	9.6
				>750	0.1	0.5	0.6
			Welders	15	4.8	0.0	4.8
				25	4.2	0.0	4.2
				50	13.0	1.5	14.5
				120	10.1	4.3	14.4
				175	0.0	0.2	0.2
		Plumas	Air Compressors	15	0.0	0.0	0.0
				25	0.1	0.0	0.1
				50	0.6	0.1	0.6
				120	3.8	1.6	5.4
				175	0.1	0.6	0.7
				250	0.2	1.2	1.4
				500	0.2	1.6	1.8
				750	0.0	0.1	0.1
				>750	0.0	0.0	0.0
			Generator Sets	15	3.1	0.0	3.1
				25	2.3	0.0	2.3
				50	2.8	0.3	3.1
				120	4.3	1.8	6.1
				175	0.2	0.7	0.9
				250	0.2	1.1	1.3
				500	0.3	2.4	2.6
				750	0.1	0.6	0.6
				>750	0.1	0.6	0.[illegible]

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
			Pressure Washers	15	0.1	0.0	0.1
				25	0.0	0.0	0.0
				50	0.1	0.0	0.1
				120	0.0	0.0	0.0
			Pumps	15	2.3	0.0	2.3
				25	0.7	0.0	0.7
				50	1.2	0.1	1.3
				120	2.4	1.0	3.4
				175	0.3	1.1	1.4
				250	0.1	0.6	0.7
				500	0.2	1.9	2.1
				>750	0.0	0.1	0.1
			Welders	15	1.1	0.0	1.1
				25	0.9	0.0	0.9
				50	2.8	0.3	3.2
				120	2.2	0.9	3.2
				175	0.0	0.0	0.1
		Sierra	Air Compressors	15	0.0	0.0	0.0
				25	0.0	0.0	0.0
				50	0.1	0.0	0.1
				120	0.6	0.3	0.9
				175	0.0	0.1	0.1
				250	0.0	0.2	0.2
				500	0.0	0.3	0.3
				750	0.0	0.0	0.0
				>750	0.0	0.0	0.0
			Generator Sets	15	0.5	0.0	0.5
				25	0.4	0.0	0.4
				50	0.5	0.1	0.5
				120	0.7	0.3	1.0
				175	0.0	0.1	0.1
				250	0.0	0.2	0.2
				500	0.0	0.4	0.4
				750	0.0	0.1	0.1
				>750	0.0	0.1	0.1
			Pressure Washers	15	0.0	0.0	0.0
				25	0.0	0.0	0.0
				50	0.0	0.0	0.0
				120	0.0	0.0	0.0
			Pumps	15	0.4	0.0	0.4
				25	0.1	0.0	0.1
				50	0.2	0.0	0.2
				120	0.4	0.2	0.6
				175	0.0	0.2	0.2
				250	0.0	0.1	0.1

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				500	0.0	0.3	0.4
				>750	0.0	0.0	0.0
			Welders	15	0.2	0.0	0.2
				25	0.2	0.0	0.2
				50	0.5	0.1	0.5
				120	0.4	0.2	0.5
				175	0.0	0.0	0.0
Northern Sonoma County APCD	North Coast	Sonoma	Air Compressors	15	0.1	0.0	0.1
				25	0.2	0.0	0.2
				50	1.6	0.2	1.8
				120	10.6	4.5	15.1
				175	0.4	1.7	2.1
				250	0.6	3.2	3.8
				500	0.5	4.5	5.0
				750	0.0	0.2	0.2
				>750	0.0	0.1	0.1
			Generator Sets	15	8.6	0.0	8.6
				25	6.3	0.0	6.3
				50	7.7	0.9	8.5
				120	11.9	5.1	17.0
				175	0.5	1.9	2.4
				250	0.5	3.1	3.7
				500	0.7	6.6	7.3
				750	0.2	1.6	1.7
				>750	0.2	1.6	1.7
			Pressure Washers	15	0.4	0.0	0.4
				25	0.1	0.0	0.1
				50	0.2	0.0	0.2
				120	0.1	0.0	0.1
			Pumps	15	6.5	0.0	6.5
				25	1.9	0.0	1.9
				50	3.4	0.4	3.7
				120	6.6	2.8	9.4
				175	0.8	3.0	3.8
				250	0.3	1.7	1.9
				500	0.6	5.2	5.8
				>750	0.0	0.3	0.4
			Welders	15	2.9	0.0	2.9
				25	2.6	0.0	2.6
				50	7.9	0.9	8.8
				120	6.1	2.6	8.8
				175	0.0	0.1	0.1
Placer County APCD	Lake Tahoe	Placer	Air Compressors	15	0.0	0.0	0.0
				25	0.0	0.0	0.0
				50	0.4	0.0	0.4

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2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				120	2.4	1.0	3.4
				175	0.1	0.4	0.5
				250	0.1	0.7	0.9
				500	0.1	1.0	1.1
				750	0.0	0.0	0.0
				>750	0.0	0.0	0.0
			Generator Sets	15	1.9	0.0	1.9
				25	1.4	0.0	1.4
				50	1.7	0.2	1.9
				120	2.7	1.2	3.9
				175	0.1	0.4	0.5
				250	0.1	0.7	0.8
				500	0.2	1.5	1.7
				750	0.0	0.4	0.4
				>750	0.0	0.4	0.4
			Pressure Washers	15	0.1	0.0	0.1
				25	0.0	0.0	0.0
				50	0.0	0.0	0.0
				120	0.0	0.0	0.0
			Pumps	15	1.5	0.0	1.5
				25	0.4	0.0	0.4
				50	0.8	0.1	0.8
				120	1.5	0.6	2.1
				175	0.2	0.7	0.9
				250	0.1	0.4	0.4
				500	0.1	1.2	1.3
				>750	0.0	0.1	0.1
			Welders	15	0.7	0.0	0.7
				25	0.6	0.0	0.6
				50	1.8	0.2	2.0
				120	1.4	0.6	2.0
				175	0.0	0.0	0.0
	Mountain Counties		Air Compressors	15	0.0	0.0	0.0
				25	0.1	0.0	0.1
				50	0.7	0.1	0.7
				120	4.4	1.9	6.3
				175	0.2	0.7	0.9
				250	0.2	1.3	1.6
				500	0.2	1.9	2.1
				750	0.0	0.1	0.1
				>750	0.0	0.0	0.0
			Generator Sets	15	3.6	0.0	3.6
				25	2.6	0.0	2.6
				50	3.2	0.4	3.5
				120	4.9	2.1	7.0

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2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				175	0.2	0.8	1.0
				250	0.2	1.3	1.5
				500	0.3	2.7	3.0
				750	0.1	0.6	0.7
				>750	0.1	0.6	0.7
			Pressure Washers	15	0.2	0.0	0.2
				25	0.0	0.0	0.0
				50	0.1	0.0	0.1
				120	0.0	0.0	0.0
			Pumps	15	2.7	0.0	2.7
				25	0.8	0.0	0.8
				50	1.4	0.2	1.5
				120	2.7	1.2	3.9
				175	0.3	1.3	1.6
				250	0.1	0.7	0.8
				500	0.2	2.2	2.4
				>750	0.0	0.1	0.2
			Welders	15	1.2	0.0	1.2
				25	1.1	0.0	1.1
				50	3.3	0.4	3.6
				120	2.5	1.1	3.6
				175	0.0	0.0	0.1
	Sacramento Valley		Air Compressors	15	0.4	0.0	0.4
				25	0.7	0.0	0.7
				50	6.3	0.7	7.0
				120	42.4	18.2	60.6
				175	1.7	6.6	8.3
				250	2.3	13.0	15.2
				500	2.0	18.1	20.2
				750	0.1	0.7	0.8
				>750	0.0	0.2	0.2
			Generator Sets	15	34.5	0.0	34.5
				25	25.2	0.0	25.2
				50	30.8	3.4	34.3
				120	47.7	20.4	68.1
				175	1.9	7.7	9.6
				250	2.2	12.5	14.7
				500	2.9	26.3	29.2
				750	0.7	6.3	7.0
				>750	0.7	6.3	7.0
			Pressure Washers	15	1.6	0.0	1.6
				25	0.4	0.0	0.4
				50	0.7	0.1	0.8
				120	0.3	0.1	0.4
			Pumps	15	25.9	0.0	25.9

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2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				25	7.7	0.0	7.7
				50	13.5	1.5	14.9
				120	26.5	11.4	37.8
				175	3.0	12.1	15.2
				250	1.2	6.6	7.8
				500	2.3	21.0	23.4
				>750	0.1	1.3	1.5
			Welders	15	11.7	0.0	11.7
				25	10.3	0.0	10.3
				50	31.7	3.5	35.2
				120	24.6	10.5	35.2
				175	0.1	0.4	0.6
Sacramento Metropolitan AQMD		Sacramento	Air Compressors	15	2.0	0.0	2.0
				25	4.0	0.0	4.0
				50	35.3	3.8	39.1
				120	235.7	101.0	336.8
				175	9.2	36.9	46.2
				250	12.7	72.0	84.7
				500	11.2	100.9	112.1
				750	0.5	4.1	4.6
				>750	0.2	1.2	1.3
			Generator Sets	15	191.7	0.0	191.7
				25	140.2	0.0	140.2
				50	171.4	19.1	190.5
				120	265.1	113.5	378.6
				175	10.7	42.7	53.4
				250	12.2	69.4	81.6
				500	16.2	146.1	162.4
				750	3.9	35.0	38.8
				>750	3.9	35.0	38.8
			Pressure Washers	15	8.9	0.0	8.9
				25	2.1	0.0	2.1
				50	4.1	0.3	4.4
				120	1.7	0.6	2.3
			Pumps	15	143.9	0.0	143.9
				25	43.0	0.0	43.0
				50	74.9	8.2	83.1
				120	147.1	63.1	210.2
				175	16.9	67.5	84.3
				250	6.5	36.8	43.3
				500	13.0	117.0	130.0
				>750	0.8	7.3	8.1
			Welders	15	65.1	0.0	65.1
				25	57.3	0.0	57.3
				50	176.3	19.7	195.9
				120	136.9	58.6	195.5

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2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				175	0.7	2.5	3.1
San Diego County APCD	San Diego	San Diego	Air Compressors	15	4.4	0.0	4.4
				25	9.1	0.0	9.1
				50	79.8	8.6	88.4
				120	533.2	228.5	761.7
				175	20.8	83.6	104.4
				250	28.7	162.9	191.6
				500	25.4	228.1	253.5
				750	1.1	9.3	10.4
				>750	0.3	2.7	3.0
			Generator Sets	15	433.5	0.0	433.5
				25	317.1	0.0	317.1
				50	387.7	43.2	430.9
				120	599.6	256.7	856.3
				175	24.2	96.7	120.9
				250	27.6	157.0	184.6
				500	36.7	330.5	367.2
				750	8.7	79.1	87.8
				>750	8.7	79.1	87.8
			Pressure Washers	15	20.1	0.0	20.1
				25	4.7	0.0	4.7
				50	9.3	0.7	9.9
				120	3.8	1.3	5.1
			Pumps	15	325.6	0.0	325.6
				25	97.3	0.0	97.3
				50	169.5	18.5	188.0
				120	332.7	142.8	475.6
				175	38.2	152.6	190.7
				250	14.7	83.3	98.0
				500	29.4	264.6	294.1
				>750	1.9	16.5	18.3
			Welders	15	147.2	0.0	147.2
				25	129.6	0.0	129.6
				50	398.7	44.5	443.2
				120	309.7	132.6	442.3
				175	1.5	5.6	7.1
San Joaquin Valley Unified APCD	San Joaquin Valley	Fresno	Air Compressors	15	1.3	0.0	1.3
				25	2.6	0.0	2.6
				50	22.7	2.5	25.2
				120	151.8	65.0	216.8
				175	5.9	23.8	29.7
				250	8.2	46.4	54.5
				500	7.2	64.9	72.2
				750	0.3	2.7	3.0
				>750	0.1	0.8	0.9

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2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
			Generator Sets	15	123.4	0.0	123.4
				25	90.3	0.0	90.3
				50	110.3	12.3	122.6
				120	170.7	73.1	243.7
				175	6.9	27.5	34.4
				250	7.9	44.7	52.5
				500	10.5	94.1	104.5
				750	2.5	22.5	25.0
				>750	2.5	22.5	25.0
			Pressure Washers	15	5.7	0.0	5.7
				25	1.3	0.0	1.3
				50	2.6	0.2	2.8
				120	1.1	0.4	1.5
			Pumps	15	92.7	0.0	92.7
				25	27.7	0.0	27.7
				50	48.2	5.3	53.5
				120	94.7	40.7	135.4
				175	10.9	43.4	54.3
				250	4.2	23.7	27.9
				500	8.4	75.3	83.7
				>750	0.5	4.7	5.2
			Welders	15	41.9	0.0	41.9
				25	36.9	0.0	36.9
				50	113.5	12.7	126.1
				120	88.1	37.7	125.9
				175	0.4	1.6	2.0
		Kern	Air Compressors	15	0.9	0.0	0.9
				25	1.8	0.0	1.8
				50	15.7	1.7	17.4
				120	105.2	45.1	150.2
				175	4.1	16.5	20.6
				250	5.7	32.1	37.8
				500	5.0	45.0	50.0
				750	0.2	1.8	2.0
				>750	0.1	0.5	0.6
			Generator Sets	15	85.5	0.0	85.5
				25	62.5	0.0	62.5
				50	76.5	8.5	85.0
				120	118.3	50.6	168.9
				175	4.8	19.1	23.8
				250	5.5	31.0	36.4
				500	7.2	65.2	72.4
				750	1.7	15.6	17.3
				>750	1.7	15.6	17.3

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2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
			Pressure Washers	15	4.0	0.0	4.0
				25	0.9	0.0	0.9
				50	1.8	0.1	2.0
				120	0.7	0.3	1.0
			Pumps	15	64.2	0.0	64.2
				25	19.2	0.0	19.2
				50	33.4	3.6	37.1
				120	65.6	28.2	93.8
				175	7.5	30.1	37.6
				250	2.9	16.4	19.3
				500	5.8	52.2	58.0
				>750	0.4	3.2	3.6
			Welders	15	29.0	0.0	29.0
				25	25.6	0.0	25.6
				50	78.6	8.8	87.4
				120	61.1	26.2	87.2
				175	0.3	1.1	1.4
		Kings	Air Compressors	15	0.2	0.0	0.2
				25	0.4	0.0	0.4
				50	3.7	0.4	4.1
				120	24.5	10.5	35.[illegible]
				175	1.0	3.8	4.8
				250	1.3	7.5	8.8
				500	1.2	10.5	11.6
				750	0.0	0.4	0.5
				>750	0.0	0.1	0.1
			Generator Sets	15	19.9	0.0	19.9
				25	14.6	0.0	14.6
				50	17.8	2.0	19.8
				120	27.5	11.8	39.3
				175	1.1	4.4	5.5
				250	1.3	7.2	8.5
				500	1.7	15.2	16.9
				750	0.4	3.6	4.0
				>750	0.4	3.6	4.0
			Pressure Washers	15	0.9	0.0	0.9
				25	0.2	0.0	0.2
				50	0.4	0.0	0.5
				120	0.2	0.1	0.2
			Pumps	15	14.9	0.0	14.9
				25	4.5	0.0	4.5
				50	7.8	0.8	8.6
				120	15.3	6.6	21.[illegible]
				175	1.8	7.0	8.[illegible]
				250	0.7	3.8	4.5

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2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				500	1.3	12.1	13.5
				>750	0.1	0.8	0.8
			Welders	15	6.8	0.0	6.8
				25	5.9	0.0	5.9
				50	18.3	2.0	20.3
				120	14.2	6.1	20.3
				175	0.1	0.3	0.3
		Madera	Air Compressors	15	0.2	0.0	0.2
				25	0.4	0.0	0.4
				50	3.6	0.4	4.0
				120	23.9	10.3	34.2
				175	0.9	3.8	4.7
				250	1.3	7.3	8.6
				500	1.1	10.2	11.4
				750	0.0	0.4	0.5
				>750	0.0	0.1	0.1
			Generator Sets	15	19.5	0.0	19.5
				25	14.2	0.0	14.2
				50	17.4	1.9	19.3
				120	26.9	11.5	38.5
				175	1.1	4.3	5.4
				250	1.2	7.0	8.3
				500	1.7	14.8	16.5
				750	0.4	3.6	3.9
				>750	0.4	3.6	3.9
			Pressure Washers	15	0.9	0.0	0.9
				25	0.2	0.0	0.2
				50	0.4	0.0	0.4
				120	0.2	0.1	0.2
			Pumps	15	14.6	0.0	14.6
				25	4.4	0.0	4.4
				50	7.6	0.8	8.4
				120	14.9	6.4	21.4
				175	1.7	6.9	8.6
				250	0.7	3.7	4.4
				500	1.3	11.9	13.2
				>750	0.1	0.7	0.8
			Welders	15	6.6	0.0	6.6
				25	5.8	0.0	5.8
				50	17.9	2.0	19.9
				120	13.9	6.0	19.9
				175	0.1	0.3	0.3
		Merced	Air Compressors	15	0.3	0.0	0.3
				25	0.7	0.0	0.7
				50	6.1	0.7	6.7

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2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				120	40.5	17.3	57.8
				175	1.6	6.3	7.9
				250	2.2	12.4	14.5
				500	1.9	17.3	19.2
				750	0.1	0.7	0.8
				>750	0.0	0.2	0.2
			Generator Sets	15	32.9	0.0	32.9
				25	24.1	0.0	24.1
				50	29.4	3.3	32.7
				120	45.5	19.5	65.0
				175	1.8	7.3	9.2
				250	2.1	11.9	14.0
				500	2.8	25.1	27.9
				750	0.7	6.0	6.7
				>750	0.7	6.0	6.7
			Pressure Washers	15	1.5	0.0	1.5
				25	0.4	0.0	0.4
				50	0.7	0.1	0.8
				120	0.3	0.1	0.4
			Pumps	15	24.7	0.0	24.7
				25	7.4	0.0	7.4
				50	12.9	1.4	14.3
				120	25.2	10.8	36.1
				175	2.9	11.6	14.5
				250	1.1	6.3	7.4
				500	2.2	20.1	22.3
				>750	0.1	1.2	1.4
			Welders	15	11.2	0.0	11.2
				25	9.8	0.0	9.8
				50	30.3	3.4	33.6
				120	23.5	10.1	33.6
				175	0.1	0.4	0.5
		San Joaquin	Air Compressors	15	0.9	0.0	0.9
				25	1.9	0.0	1.9
				50	16.5	1.8	18.2
				120	110.0	47.1	157.1
				175	4.3	17.2	21.5
				250	5.9	33.6	39.5
				500	5.2	47.1	52.3
				750	0.2	1.9	2.1
				>750	0.1	0.5	0.6
			Generator Sets	15	89.4	0.0	89.4
				25	65.4	0.0	65.4
				50	80.0	8.9	88.9
				120	123.7	53.0	176.7

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				175	5.0	19.9	24.9
				250	5.7	32.4	38.1
				500	7.6	68.2	75.8
				750	1.8	16.3	18.1
				>750	1.8	16.3	18.1
			Pressure Washers	15	4.2	0.0	4.2
				25	1.0	0.0	1.0
				50	1.9	0.1	2.0
				120	0.8	0.3	1.1
			Pumps	15	67.2	0.0	67.2
				25	20.1	0.0	20.1
				50	35.0	3.8	38.8
				120	68.6	29.5	98.1
				175	7.9	31.5	39.3
				250	3.0	17.2	20.2
				500	6.1	54.6	60.7
				>750	0.4	3.4	3.8
			Welders	15	30.4	0.0	30.4
				25	26.7	0.0	26.7
				50	82.3	9.2	91.4
				120	63.9	27.4	91.2
				175	0.3	1.1	1.5
		Stanislaus	Air Compressors	15	0.7	0.0	0.7
				25	1.5	0.0	1.5
				50	13.0	1.4	14.4
				120	86.7	37.1	123.8
				175	3.4	13.6	17.0
				250	4.7	26.5	31.1
				500	4.1	37.1	41.2
				750	0.2	1.5	1.7
				>750	0.1	0.4	0.5
			Generator Sets	15	70.5	0.0	70.5
				25	51.5	0.0	51.5
				50	63.0	7.0	70.0
				120	97.5	41.7	139.2
				175	3.9	15.7	19.7
				250	4.5	25.5	30.0
				500	6.0	53.7	59.7
				750	1.4	12.9	14.3
				>750	1.4	12.9	14.3
			Pressure Washers	15	3.3	0.0	3.3
				25	0.8	0.0	0.8
				50	1.5	0.1	1.6
				120	0.6	0.2	0.8
			Pumps	15	52.9	0.0	52.9

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				25	15.8	0.0	15.8
				50	27.6	3.0	30.6
				120	54.1	23.2	77.3
				175	6.2	24.8	31.0
				250	2.4	13.5	15.9
				500	4.8	43.0	47.8
				>750	0.3	2.7	3.0
			Welders	15	23.9	0.0	23.9
				25	21.1	0.0	21.1
				50	64.8	7.2	72.0
				120	50.3	21.6	71.9
				175	0.2	0.9	1.1
		Tulare	Air Compressors	15	0.6	0.0	0.6
				25	1.2	0.0	1.2
				50	10.4	1.1	11.5
				120	69.4	29.7	99.1
				175	2.7	10.9	13.6
				250	3.7	21.2	24.9
				500	3.3	29.7	33.0
				750	0.1	1.2	1.4
				>750	0.0	0.3	0.4
			Generator Sets	15	56.4	0.0	56.4
				25	41.3	0.0	41.3
				50	50.5	5.6	56.1
				120	78.0	33.4	111.4
				175	3.2	12.6	15.7
				250	3.6	20.4	24.0
				500	4.8	43.0	47.8
				750	1.1	10.3	11.4
				>750	1.1	10.3	11.4
			Pressure Washers	15	2.6	0.0	2.6
				25	0.6	0.0	0.6
				50	1.2	0.1	1.3
				120	0.5	0.2	0.7
			Pumps	15	42.4	0.0	42.4
				25	12.7	0.0	12.7
				50	22.1	2.4	24.5
				120	43.3	18.6	61.9
				175	5.0	19.9	24.8
				250	1.9	10.8	12.8
				500	3.8	34.4	38.3
				>750	0.2	2.1	2.4
			Welders	15	19.2	0.0	19.2
				25	16.9	0.0	16.9
				50	51.9	5.8	57.7
				120	40.3	17.3	57.6

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				175	0.2	0.7	0.9
San Luis Obispo County APCD	South Central Coast	San Luis Obispo	Air Compressors	15	0.4	0.0	0.4
				25	0.8	0.0	0.8
				50	6.9	0.7	7.7
				120	46.2	19.8	66.0
				175	1.8	7.2	9.1
				250	2.5	14.1	16.6
				500	2.2	19.8	22.0
				750	0.1	0.8	0.9
				>750	0.0	0.2	0.3
			Generator Sets	15	37.6	0.0	37.6
				25	27.5	0.0	27.5
				50	33.6	3.7	37.4
				120	52.0	22.3	74.3
				175	2.1	8.4	10.5
				250	2.4	13.6	16.0
				500	3.2	28.7	31.8
				750	0.8	6.9	7.6
				>750	0.8	6.9	7.6
			Pressure Washers	15	1.7	0.0	1.7
				25	0.4	0.0	0.4
				50	0.8	0.1	0.9
				120	0.3	0.1	0.4
			Pumps	15	28.2	0.0	28.2
				25	8.4	0.0	8.4
				50	14.7	1.6	16.3
				120	28.9	12.4	41.2
				175	3.3	13.2	16.5
				250	1.3	7.2	8.5
				500	2.6	22.9	25.5
				>750	0.2	1.4	1.6
			Welders	15	12.8	0.0	12.8
				25	11.2	0.0	11.2
				50	34.6	3.9	38.4
				120	26.9	11.5	38.4
				175	0.1	0.5	0.6
Santa Barbara County APCD		Santa Barbara	Air Compressors	15	0.6	0.0	0.6
				25	1.3	0.0	1.3
				50	11.1	1.2	12.3
				120	74.1	31.7	105.8
				175	2.9	11.6	14.5
				250	4.0	22.6	26.6
				500	3.5	31.7	35.2
				750	0.1	1.3	1.4
				>750	0.0	0.4	0.4

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
			Generator Sets	15	60.2	0.0	60.2
				25	44.1	0.0	44.1
				50	53.9	6.0	59.9
				120	83.3	35.7	119.0
				175	3.4	13.4	16.8
				250	3.8	21.8	25.7
				500	5.1	45.9	51.0
				750	1.2	11.0	12.2
				>750	1.2	11.0	12.2
			Pressure Washers	15	2.8	0.0	2.8
				25	0.6	0.0	0.6
				50	1.3	0.1	1.4
				120	0.5	0.2	0.7
			Pumps	15	45.2	0.0	45.2
				25	13.5	0.0	13.5
				50	23.6	2.6	26.1
				120	46.2	19.8	66.1
				175	5.3	21.2	26.5
				250	2.0	11.6	13.6
				500	4.1	36.8	40.9
				>750	0.3	2.3	2.5
			Welders	15	20.5	0.0	20.5
				25	18.0	0.0	18.0
				50	55.4	6.2	61.6
				120	43.0	18.4	61.5
				175	0.2	0.8	1.0
Shasta County AQMD	Sacramento Valley	Shasta	Air Compressors	15	0.3	0.0	0.3
				25	0.5	0.0	0.5
				50	4.6	0.5	5.2
				120	31.1	13.3	44.4
				175	1.2	4.9	6.1
				250	1.7	9.5	11.2
				500	1.5	13.3	14.8
				750	0.1	0.5	0.6
				>750	0.0	0.2	0.2
			Generator Sets	15	25.3	0.0	25.3
				25	18.5	0.0	18.5
				50	22.6	2.5	25.1
				120	35.0	15.0	49.9
				175	1.4	5.6	7.0
				250	1.6	9.2	10.8
				500	2.1	19.3	21.4
				750	0.5	4.6	5.1
				>750	0.5	4.6	5.1

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2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
			Pressure Washers	15	1.2	0.0	1.2
				25	0.3	0.0	0.3
				50	0.5	0.0	0.6
				120	0.2	0.1	0.3
			Pumps	15	19.0	0.0	19.0
				25	5.7	0.0	5.7
				50	9.9	1.1	11.0
				120	19.4	8.3	27.7
				175	2.2	8.9	11.1
				250	0.9	4.9	5.7
				500	1.7	15.4	17.1
				>750	0.1	1.0	1.1
			Welders	15	8.6	0.0	8.6
				25	7.6	0.0	7.6
				50	23.2	2.6	25.8
				120	18.1	7.7	25.8
				175	0.1	0.3	0.4
Siskiyou County APCD	Northeast Plateau	Siskiyou	Air Compressors	15	0.1	0.0	0.1
				25	0.1	0.0	0.1
				50	1.2	0.1	1.3
				120	8.0	3.4	11.5
				175	0.3	1.3	1.6
				250	0.4	2.5	2.9
				500	0.4	3.4	3.8
				750	0.0	0.1	0.2
				>750	0.0	0.0	0.0
			Generator Sets	15	6.5	0.0	6.5
				25	4.8	0.0	4.8
				50	5.9	0.7	6.5
				120	9.0	3.9	12.9
				175	0.4	1.5	1.8
				250	0.4	2.4	2.8
				500	0.6	5.0	5.5
				750	0.1	1.2	1.3
				>750	0.1	1.2	1.3
			Pressure Washers	15	0.3	0.0	0.3
				25	0.1	0.0	0.1
				50	0.1	0.0	0.1
				120	0.1	0.0	0.1
			Pumps	15	4.9	0.0	4.9
				25	1.5	0.0	1.5
				50	2.6	0.3	2.8
				120	5.0	2.2	7.2
				175	0.6	2.3	2.9
				250	0.2	1.3	1.5

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2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				500	0.4	4.0	4.4
				>750	0.0	0.2	0.3
			Welders	15	2.2	0.0	2.2
				25	2.0	0.0	2.0
				50	6.0	0.7	6.7
				120	4.7	2.0	6.7
				175	0.0	0.1	0.1
South Coast AQMD	Mojave Desert	Riverside	Air Compressors	15	0.0	0.0	0.0
				25	0.0	0.0	0.0
				50	0.3	0.0	0.3
				120	1.8	0.8	2.6
				175	0.1	0.3	0.4
				250	0.1	0.6	0.7
				500	0.1	0.8	0.9
				750	0.0	0.0	0.0
				>750	0.0	0.0	0.0
			Generator Sets	15	1.5	0.0	1.5
				25	1.1	0.0	1.1
				50	1.3	0.1	1.5
				120	2.1	0.9	2.9
				175	0.1	0.3	0.4
				250	0.1	0.5	0.6
				500	0.1	1.1	1.3
				750	0.0	0.3	0.3
				>750	0.0	0.3	0.3
			Pressure Washers	15	0.1	0.0	0.1
				25	0.0	0.0	0.0
				50	0.0	0.0	0.0
				120	0.0	0.0	0.0
			Pumps	15	1.1	0.0	1.1
				25	0.3	0.0	0.3
				50	0.6	0.1	0.6
				120	1.1	0.5	1.6
				175	0.1	0.5	0.7
				250	0.1	0.3	0.3
				500	0.1	0.9	1.0
				>750	0.0	0.1	0.1
			Welders	15	0.5	0.0	0.5
				25	0.4	0.0	0.4
				50	1.4	0.2	1.5
				120	1.1	0.5	1.5
				175	0.0	0.0	0.0
	Salton Sea		Air Compressors	15	0.5	0.0	0.5
				25	1.1	0.0	1.1
				50	9.5	1.0	10.6

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				120	63.8	27.3	91.1
				175	2.5	10.0	12.5
				250	3.4	19.5	22.9
				500	3.0	27.3	30.3
				750	0.1	1.1	1.2
				>750	0.0	0.3	0.4
			Generator Sets	15	51.8	0.0	51.8
				25	37.9	0.0	37.9
				50	46.4	5.2	51.5
				120	71.7	30.7	102.4
				175	2.9	11.6	14.5
				250	3.3	18.8	22.1
				500	4.4	39.5	43.9
				750	1.0	9.5	10.5
				>750	1.0	9.5	10.5
			Pressure Washers	15	2.4	0.0	2.4
				25	0.6	0.0	0.6
				50	1.1	0.1	1.2
				120	0.5	0.2	0.6
			Pumps	15	38.9	0.0	38.9
				25	11.6	0.0	11.6
				50	20.3	2.2	22.5
				120	39.8	17.1	56.9
				175	4.6	18.2	22.8
				250	1.8	10.0	11.7
				500	3.5	31.6	35.2
				>750	0.2	2.0	2.2
			Welders	15	17.6	0.0	17.6
				25	15.5	0.0	15.5
				50	47.7	5.3	53.0
				120	37.0	15.9	52.9
				175	0.2	0.7	0.8
	South Coast	Los Angeles	Air Compressors	15	14.4	0.0	14.4
				25	29.7	0.0	29.7
				50	260.6	28.3	288.9
				120	1742.6	746.7	2489.3
				175	68.1	273.1	341.2
				250	93.8	532.3	626.1
				500	82.8	745.6	828.4
				750	3.5	30.4	33.9
				>750	1.1	8.7	9.8
			Generator Sets	15	1416.7	0.0	1416.7
				25	1036.3	0.0	1036.3
				50	1266.9	141.3	1408.2
				120	1959.4	839.0	2798.4

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2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				175	79.1	316.0	395.1
				250	90.3	513.0	603.3
				500	120.1	1080.0	1200.1
				750	28.6	258.4	287.0
				>750	28.6	258.4	287.0
			Pressure Washers	15	65.8	0.0	65.8
				25	15.3	0.0	15.3
				50	30.3	2.2	32.5
				120	12.4	4.3	16.8
			Pumps	15	1064.0	0.0	1064.0
				25	317.8	0.0	317.8
				50	553.9	60.3	614.3
				120	1087.4	466.8	1554.2
				175	124.7	498.6	623.3
				250	47.9	272.3	320.2
				500	96.1	864.9	961.0
				>750	6.0	53.8	59.8
			Welders	15	481.2	0.0	481.2
				25	423.5	0.0	423.5
				50	1303.0	145.4	1448.4
				120	1012.0	433.4	1445
				175	4.9	18.2	23.
		Orange	Air Compressors	15	4.4	0.0	4.4
				25	9.2	0.0	9.2
				50	80.3	8.7	89.0
				120	536.8	230.0	766.8
				175	21.0	84.1	105.1
				250	28.9	164.0	192.8
				500	25.5	229.7	255.2
				750	1.1	9.4	10.4
				>750	0.4	2.7	3.0
			Generator Sets	15	436.4	0.0	436.4
				25	319.2	0.0	319.2
				50	390.2	43.5	433.8
				120	603.5	258.4	862.0
				175	24.4	97.3	121.7
				250	27.8	158.0	185.8
				500	37.0	332.7	369.7
				750	8.8	79.6	88.4
				>750	8.8	79.6	88.4
			Pressure Washers	15	20.3	0.0	20.3
				25	4.7	0.0	4.7
				50	9.3	0.7	10.0
				120	3.8	1.3	5.2
			Pumps	15	327.7	0.0	327.7

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2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				25	97.9	0.0	97.9
				50	170.6	18.6	189.2
				120	334.9	143.8	478.7
				175	38.4	153.6	192.0
				250	14.8	83.9	98.6
				500	29.6	266.4	296.0
				>750	1.9	16.6	18.4
			Welders	15	148.2	0.0	148.2
				25	130.4	0.0	130.4
				50	401.4	44.8	446.1
				120	311.7	133.5	445.2
				175	1.5	5.6	7.1
		Riverside	Air Compressors	15	2.0	0.0	2.0
				25	4.0	0.0	4.0
				50	35.3	3.8	39.1
				120	235.8	101.0	336.9
				175	9.2	37.0	46.2
				250	12.7	72.0	84.7
				500	11.2	100.9	112.1
				750	0.5	4.1	4.6
				>750	0.2	1.2	1.3
			Generator Sets	15	191.7	0.0	191.7
				25	140.2	0.0	140.2
				50	171.5	19.1	190.6
				120	265.2	113.6	378.7
				175	10.7	42.8	53.5
				250	12.2	69.4	81.7
				500	16.3	146.2	162.4
				750	3.9	35.0	38.8
				>750	3.9	35.0	38.8
			Pressure Washers	15	8.9	0.0	8.9
				25	2.1	0.0	2.1
				50	4.1	0.3	4.4
				120	1.7	0.6	2.3
			Pumps	15	144.0	0.0	144.0
				25	43.0	0.0	43.0
				50	75.0	8.2	83.1
				120	147.2	63.2	210.3
				175	16.9	67.5	84.4
				250	6.5	36.8	43.3
				500	13.0	117.0	130.1
				>750	0.8	7.3	8.1
			Welders	15	65.1	0.0	65.1
				25	57.3	0.0	57.3
				50	176.3	19.7	196.0
				120	137.0	58.7	195.6

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2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				175	0.7	2.5	3.1
		San Bernardino	Air Compressors	15	2.1	0.0	2.1
				25	4.4	0.0	4.4
				50	38.3	4.2	42.4
				120	256.0	109.7	365.7
				175	10.0	40.1	50.1
				250	13.8	78.2	92.0
				500	12.2	109.5	121.7
				750	0.5	4.5	5.0
				>750	0.2	1.3	1.4
			Generator Sets	15	208.1	0.0	208.1
				25	152.2	0.0	152.2
				50	186.1	20.8	206.9
				120	287.8	123.3	411.1
				175	11.6	46.4	58.0
				250	13.3	75.4	88.6
				500	17.6	158.7	176.3
				750	4.2	38.0	42.2
				>750	4.2	38.0	42.2
			Pressure Washers	15	9.7	0.0	9.7
				25	2.2	0.0	2.2
				50	4.5	0.3	4.8
				120	1.8	0.6	2.5
			Pumps	15	156.3	0.0	156.3
				25	46.7	0.0	46.7
				50	81.4	8.9	90.2
				120	159.7	68.6	228.3
				175	18.3	73.2	91.6
				250	7.0	40.0	47.0
				500	14.1	127.0	141.2
				>750	0.9	7.9	8.8
			Welders	15	70.7	0.0	70.7
				25	62.2	0.0	62.2
				50	191.4	21.4	212.8
				120	148.7	63.7	212.3
				175	0.7	2.7	3.4
Tehama County APCD	Sacramento Valley	Tehama	Air Compressors	15	0.1	0.0	0.1
				25	0.2	0.0	0.2
				50	1.6	0.2	1.7
				120	10.4	4.5	14.9
				175	0.4	1.6	2.0
				250	0.6	3.2	3.7
				500	0.5	4.5	4.9
				750	0.0	0.2	0.2
				>750	0.0	0.1	0.1

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
			Generator Sets	15	8.5	0.0	8.5
				25	6.2	0.0	6.2
				50	7.6	0.8	8.4
				120	11.7	5.0	16.7
				175	0.5	1.9	2.4
				250	0.5	3.1	3.6
				500	0.7	6.5	7.2
				750	0.2	1.5	1.7
				>750	0.2	1.5	1.7
			Pressure Washers	15	0.4	0.0	0.4
				25	0.1	0.0	0.1
				50	0.2	0.0	0.2
				120	0.1	0.0	0.1
			Pumps	15	6.4	0.0	6.4
				25	1.9	0.0	1.9
				50	3.3	0.4	3.7
				120	6.5	2.8	9.3
				175	0.7	3.0	3.7
				250	0.3	1.6	1.9
				500	0.6	5.2	5.7
				>750	0.0	0.3	0.4
			Welders	15	2.9	0.0	2.9
				25	2.5	0.0	2.5
				50	7.8	0.9	8.7
				120	6.0	2.6	8.6
				175	0.0	0.1	0.1
Tuolumne County APCD	Mountain Counties	Tuolumne	Air Compressors	15	0.1	0.0	0.1
				25	0.2	0.0	0.2
				50	1.5	0.2	1.7
				120	10.2	4.4	14.6
				175	0.4	1.6	2.0
				250	0.5	3.1	3.7
				500	0.5	4.4	4.9
				750	0.0	0.2	0.2
				>750	0.0	0.1	0.1
			Generator Sets	15	8.3	0.0	8.3
				25	6.1	0.0	6.1
				50	7.4	0.8	8.3
				120	11.5	4.9	16.4
				175	0.5	1.9	2.3
				250	0.5	3.0	3.5
				500	0.7	6.3	7.0
				750	0.2	1.5	1.7
				>750	0.2	1.5	1.7

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
			Pressure Washers	15	0.4	0.0	0.4
				25	0.1	0.0	0.1
				50	0.2	0.0	0.2
				120	0.1	0.0	0.1
			Pumps	15	6.2	0.0	6.2
				25	1.9	0.0	1.9
				50	3.2	0.4	3.6
				120	6.4	2.7	9.1
				175	0.7	2.9	3.7
				250	0.3	1.6	1.9
				500	0.6	5.1	5.6
				>750	0.0	0.3	0.4
			Welders	15	2.8	0.0	2.8
				25	2.5	0.0	2.5
				50	7.6	0.9	8.5
				120	5.9	2.5	8.5
				175	0.0	0.1	0.1
Ventura County APCD	South Central Coast	Ventura	Air Compressors	15	1.2	0.0	1.2
				25	2.4	0.0	2.4
				50	21.4	2.3	23.7
				120	142.7	61.2	203.[illegible]
				175	5.6	22.4	27.9
				250	7.7	43.6	51.3
				500	6.8	61.1	67.9
				750	0.3	2.5	2.8
				>750	0.1	0.7	0.8
			Generator Sets	15	116.0	0.0	116.0
				25	84.9	0.0	84.9
				50	103.8	11.6	115.4
				120	160.5	68.7	229.2
				175	6.5	25.9	32.4
				250	7.4	42.0	49.4
				500	9.8	88.5	98.3
				750	2.3	21.2	23.5
				>750	2.3	21.2	23.5
			Pressure Washers	15	5.4	0.0	5.4
				25	1.3	0.0	1.3
				50	2.5	0.2	2.7
				120	1.0	0.4	1.4
			Pumps	15	87.2	0.0	87.2
				25	26.0	0.0	26.0
				50	45.4	4.9	50.3
				120	89.1	38.2	127.[illegible]
				175	10.2	40.8	51.[illegible]
				250	3.9	22.3	26.2

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				500	7.9	70.8	78.7
				>750	0.5	4.4	4.9
			Welders	15	39.4	0.0	39.4
				25	34.7	0.0	34.7
				50	106.7	11.9	118.6
				120	82.9	35.5	118.4
				175	0.4	1.5	1.9
Yolo/Solano AQMD	Sacramento Valley	Solano	Air Compressors	15	0.2	0.0	0.2
				25	0.4	0.0	0.4
				50	3.4	0.4	3.8
				120	22.8	9.8	32.5
				175	0.9	3.6	4.5
				250	1.2	7.0	8.2
				500	1.1	9.7	10.8
				750	0.0	0.4	0.4
				>750	0.0	0.1	0.1
			Generator Sets	15	18.5	0.0	18.5
				25	13.5	0.0	13.5
				50	16.6	1.8	18.4
				120	25.6	11.0	36.6
				175	1.0	4.1	5.2
				250	1.2	6.7	7.9
				500	1.6	14.1	15.7
				750	0.4	3.4	3.8
				>750	0.4	3.4	3.8
			Pressure Washers	15	0.9	0.0	0.9
				25	0.2	0.0	0.2
				50	0.4	0.0	0.4
				120	0.2	0.1	0.2
			Pumps	15	13.9	0.0	13.9
				25	4.2	0.0	4.2
				50	7.2	0.8	8.0
				120	14.2	6.1	20.3
				175	1.6	6.5	8.1
				250	0.6	3.6	4.2
				500	1.3	11.3	12.6
				>750	0.1	0.7	0.8
			Welders	15	6.3	0.0	6.3
				25	5.5	0.0	5.5
				50	17.0	1.9	18.9
				120	13.2	5.7	18.9
				175	0.1	0.2	0.3
		Yolo	Air Compressors	15	0.3	0.0	0.3
				25	0.6	0.0	0.6
				50	4.9	0.5	5.4

Attachment F

2002 OFFROAD-PSR Stationary Diesel Population

Location			Equipment				
District	Air Basin	County	Equipment Type	Horsepower Class	Mobile	Stationary	Total
				120	32.5	13.9	46.5
				175	1.3	5.1	6.4
				250	1.8	9.9	11.7
				500	1.5	13.9	15.5
				750	0.1	0.6	0.6
				>750	0.0	0.2	0.2
			Generator Sets	15	26.4	0.0	26.4
				25	19.3	0.0	19.3
				50	23.6	2.6	26.3
				120	36.6	15.7	52.2
				175	1.5	5.9	7.4
				250	1.7	9.6	11.3
				500	2.2	20.2	22.4
				750	0.5	4.8	5.4
				>750	0.5	4.8	5.4
			Pressure Washers	15	1.2	0.0	1.2
				25	0.3	0.0	0.3
				50	0.6	0.0	0.6
				120	0.2	0.1	0.3
			Pumps	15	19.9	0.0	19.9
				25	5.9	0.0	5.9
				50	10.3	1.1	11.5
				120	20.3	8.7	29.0
				175	2.3	9.3	11.6
				250	0.9	5.1	6.0
				500	1.8	16.1	17.9
				>750	0.1	1.0	1.1
			Welders	15	9.0	0.0	9.0
				25	7.9	0.0	7.9
				50	24.3	2.7	27.0
				120	18.9	8.1	27.0
				175	0.1	0.3	0.4
				Statewide Total	55091.9	31619.0	86710.9

Air Resources Board

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Chairman
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"nston H. Hickox
,ency Secretary

Gray Davis
Governor

MEMORANDUM

TO: Randy Pasek, Chief, Emission Inventory Branch

FROM: Michael Benjamin, Manager, Emission Inventory Systems Section

DATE: March 27, 2003

SUBJECT: **Updated Agricultural Irrigation Pump Emission Inventory**

With the assistance of local air district staff, we have updated the statewide emission inventory for diesel-fueled agricultural irrigation pumps. Agricultural irrigation engines (EIC 052-042-1200-0000) is one of the area source categories for which the local air districts are responsible for estimating emissions. As part of this update process, we contacted seventeen air districts with significant irrigated agricultural acreage to obtain their best estimates of the current population and emissions from stationary and mobile diesel-fueled agricultural irrigation engines. The revised statewide population and emission estimates are provided in Table 1. We estimate there are approximately 8,200 diesel-fueled agricultural irrigation pumps statewide that emit 4.7 tons per day (tpd) of ROG, 48.9 tpd of NOx, and 3.7 tpd of PM on an average summer day.

Specific to the San Joaquin Valley, the updated information differs from that recently discussed by the Emission Inventory Subcommittee of the California Air Resources Board Agriculture Advisory Committee for Air Quality. As directed by the Subcommittee on February 19, we have worked with staff from the San Joaquin Valley UAPCD to explicitly account for the benefits of the Carl Moyer Program. As you can see in Table 2, although the number of pumps in the SJV has increased, the overall emissions have not changed significantly since we also revised our assumptions about the number of operating hours and emission factors. We will be providing the EI Subcommittee with a written report that will discuss in greater detail the assumptions used in developing the revised inventory for the SJV.

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our Website: http://www.arb.ca.gov.

California Environmental Protection Agency

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Attachment G

Table 1. Statewide Population and Summer Emissions for Diesel-Fueled Agricultural Irrigation Pumps

Region	Air District	County	COUNTY TOTALS SUMMER EMISSIONS (TPD)				REGION TOTALS SUMMER EMISSIONS (TPD)			
			POPULATION	ROG	NOX	PM	POPULATION	ROG	NOX	PM
North Central Coast	Monterey Bay Unified APCD	Monterey	450	0.123	0.970	0.069				
North Central Coast	Monterey Bay Unified APCD	Santa Cruz	62	0.017	0.134	0.010				
North Central Coast	Monterey Bay Unified APCD	San Benito	56	0.015	0.120	0.008	568	0.155	1.224	0.087
Sacramento Nonattainment	El Dorado County APCD	El Dorado	20	0.005	0.073	0.005				
Sacramento Nonattainment	Feather River AQMD	Sutter	181	0.244	2.768	0.204				
Sacramento Nonattainment	Placer County APCD	Placer	64	0.023	0.284	0.021				
Sacramento Nonattainment	Sacramento Metropolitan AQMD	Sacramento	122	0.040	0.505	0.036				
Sacramento Nonattainment	Yolo/Solano AQMD	Solano	134	0.073	0.868	0.063				
Sacramento Nonattainment	Yolo/Solano AQMD	Yolo	643	0.426	4.889	0.353	1164	0.812	9.387	0.682
Sacramento Valley Attainment	Butte County AQMD	Butte	163	0.044	0.351	0.025				
Sacramento Valley Attainment	Colusa County APCD	Colusa	100	0.026	0.214	0.016				
Sacramento Valley Attainment	Glenn County APCD	Glenn	130	0.034	0.280	0.020				
Sacramento Valley Attainment	Tehama County APCD	Tehama	200	0.053	0.427	0.030	593	0.158	1.271	0.091
Salton Sea	Imperial County APCD	Imperial	200	0.053	0.430	0.031	200	0.053	0.430	0.031
San Diego	San Diego County APCD	San Diego	75	0.020	0.161	0.011	75	0.020	0.161	0.011
San Francisco	Bay Area AQMD	Alameda	35	0.009	0.075	0.005				
San Francisco	Bay Area AQMD	Contra Costa	44	0.012	0.095	0.007				
San Francisco	Bay Area AQMD	Marin	17	0.005	0.037	0.002				
San Francisco	Bay Area AQMD	Napa	74	0.019	0.159	0.011				
San Francisco	Bay Area AQMD	San Francisco	0	0.000	0.000	0.000				
San Francisco	Bay Area AQMD	San Mateo	21	0.006	0.045	0.003				
San Francisco	Bay Area AQMD	Santa Clara	82	0.022	0.175	0.012				
San Francisco	Bay Area AQMD	Solano	0	0.000	0.000	0.000				
San Francisco	Bay Area AQMD	Sonoma	147	0.040	0.315	0.022	420	0.113	0.901	0.062
San Joaquin Valley	San Joaquin Valley Unified APCD	Fresno	1415	0.638	8.395	0.674				
San Joaquin Valley	San Joaquin Valley Unified APCD	Kern	1066	0.661	6.848	0.525				
San Joaquin Valley	San Joaquin Valley Unified APCD	Kings	525	0.222	3.152	0.281				
San Joaquin Valley	San Joaquin Valley Unified APCD	Madera	414	0.193	2.437	0.187				
San Joaquin Valley	San Joaquin Valley Unified APCD	Merced	270	0.144	1.609	0.128				
San Joaquin Valley	San Joaquin Valley Unified APCD	San Joaquin	413	0.185	2.417	0.187				
San Joaquin Valley	San Joaquin Valley Unified APCD	Stanislaus	111	0.047	0.660	0.052				
San Joaquin Valley	San Joaquin Valley Unified APCD	Tulare	286	0.705	2.946	0.145	4500	2.796	28.465	2.179
South Central Coast	Santa Barbara County APCD	Santa Barbara	100	0.188	2.294	0.167				
South Central Coast	Ventura County APCD	Ventura	335	0.200	2.512	0.207	435	0.387	4.806	0.374
South Coast	South Coast AQMD	Los Angeles	54	0.032	0.474	0.034				
South Coast	South Coast AQMD	Orange	28	0.017	0.249	0.018				
South Coast	South Coast AQMD	Riverside	139	0.087	1.215	0.087				
South Coast	South Coast AQMD	San Bernardino	36	0.024	0.304	0.022	257	0.161	2.241	0.160
	Grand Total (tons/day)		8212	4.654	48.886	3.678	8212	4.654	48.886	3.678

Table 2. Previous and Revised San Joaquin Valley Agricultural Irrigation Pump Emission Inventories

		Summer Emissions[3] (tons per day)		
Estimate	Population	ROG	NOx	PM
Previous[1]	2830	2.05	29.97	2.70
Revised[2]	4500	2.80	28.47	2.18

[1]Based on 1996 report prepared for the SJVUAPCD by Sonoma Technology, Inc.
[2]2003 estimate developed by SJVUAPCD and ARB staff based on Carl Moyer Program applications and 1996 STI report
[3]Summer emissions calculated based on STI survey data indicating 67% of ag irrigation pump usage occurs in summer months.

Appendix E

Stationary Diesel-Fueled Engines
Health Risk Assessment Methodology

Introduction

This appendix presents the methodology used to estimate the potential cancer risk from exposure to diesel particulate matter (PM) emitted from diesel-fuel stationary engines. The methodology was developed to assist in development of the *Stationary Diesel-Fueled Engine Airborne Toxic Control Measure (ATCM)*.

The estimated risks and assumptions used to determine these risks are not based on a specific engine location or operating parameters. Instead, general assumptions bracketing a fairly broad range of possible operating scenarios were used.

Exposures were estimated at varying downwind distances, including the "point of maximum impact" (PMI) as determined using air dispersion modeling. The estimated risk ranges are used to provide a "qualitative" assessment of the potential risk levels near operating stationary diesel-fueled engines. Actual risk levels will vary due to site specific parameters, including horsepower rating and configuration of the engine, emission rates, operating schedules, site configuration, site meteorology, and distance to receptors.

Source Description

The following methodology was developed to provide estimates of the potential cancer risk associated with exposures to diesel PM emissions from stationary diesel-fueled engines.

Stationary diesel-fueled engines are generally categorized as either prime engines or emergency back-up engines. Prime engines are used to power equipment such as compressors, cranes, generators, pumps, and grinders. Emergency back-up engines are used solely for emergency back-up electric power generation or water pumping. The main difference between prime and emergency back-up engines is that prime engines usually operate considerably more hours per year.

The methodology used in this risk assessment is consistent with the Tier-1 analysis presented in the draft Office of Environmental Health Hazard Assessment (OEHHA), Air Toxics Hot Spots Program Risk Assessment Guidelines: The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments (OEHHA, 2002a). The OEHHA draft guidelines and this assessment utilize health and exposure assessment information that is contained in the Air Toxics Hot Spot Program Risk Assessment Guidelines, Part II, Technical Support Document for Describing Available Cancer Potency Factors (OEHHA 2002b); and the Air Toxics Hot Spot Program Risk Assessment Guidelines, Part IV, Technical Support Document for Exposure Analysis and Stochastic Analysis (OEHHA 2000), respectively.

Modeling Assumptions

For this modeling exercise we used a matrix of parameters. We modeled engines of 200, 550, and 1500 horsepower, and varied both the emissions rate and the hours of operation for each horsepower rating. For each engine horsepower, we modeled

five diesel PM emission factors: 0.01, 0.15, 0.40, 0.55, and 1.0 grams/brake hp-hour. We also varied the hours of operation and evaluated the risks for the following hours of operation: 10, 20, 30, 40, 50, 100, 200, 300, 400, 500, and 1000 hours/year. For each case we calculated the risk at varying downwind distances.

Model Used

The PM emissions are modeled in this scenario using the United States Environmental Protection Agency's Industrial Source Complex Short Term Model – Version 3 (ISCST3 Date: 00101). The ISCST3 is an air dispersion model that allows an estimation of the annual average above ambient diesel PM concentrations.[1] The potential cancer risk to nearby residential receptors is obtained by multiplying annual average above ambient concentration of diesel PM by the unit risk factor (URF) for diesel PM (300 excess cancers/ug/m^3 over a 70-year exposure period). The results are expressed as an estimate of potential cancer risk in chances per million.

Meteorological Data

Meteorological data are site-specific parameters that are used in air dispersion models to calculate concentrations of emissions and subsequent risk. For this scenario, West Los Angeles, 1981, meteorological data were selected as the input to the ISCST3 model. The West Los Angeles meteorological data tend to provide higher estimates of risk than most of the other meteorological data sets compiled by ARB. This is because the West Los Angeles site tends to have the lowest average wind speed and more persistent wind directions, which result in less dispersion of pollutants.

Model Parameters and Emission Factors

The key modeling parameters and emission factors are presented in Table 1. We used the rural dispersion coefficient to provide a more conservative (higher) estimate of the predicted concentration and the estimated potential cancer risk.

[1]The pollutant concentrations obtained from this modeling exercise that are used to estimate cancer risk do not include the background (or ambient) levels of the modeled pollutant. The final risk value is determined by multiplying the modeled pollutant concentration by the Unit Risk Factor (URF), as determined by ARB and the Office of Environmental Health Hazard Assessment (OEHHA).

Table 1: Modeling and Health Risk Assessment Parameters

Modeling Paramenters	
Model	ISCST3 (Version 00101)
Engine Horsepower (at 100% load)	200 HP, 550 HP, 1500 HP
Engine Operation Load	75%
Emission Factor	0.01, 0.15, 0.40, 0.55, 1.00 g/bhp-hr
Operation Hours (annual)	10, 20, 30, 40, 50, 100, 200, 300, 400, 500, 1000
Source Type	Point
Dispersion Setting	Rural
Receptor Height	1.5 m
Stack Information:	
Stack Diameter	4 in, 6 in, and 13 in
Stack Height	3 m
Stack Temperature	622 K
Stack Exhaust Velocity	59.8 m/s, 73.1 m/s, and 42.5 m/s
Time Emissions Emitted	3 p.m.
Meteorological Data	West L. A. (1981)
Release Height	Same as the stack height
Health Risk Assessment Parameters	
Receptor's Hypothetical Exposure Time	70 years, 50 weeks per year
Adult Daily Breathing Rate Range	271 - 393 l/kg body weight -day [1]
Adult Body Weight	70 kg
Diesel PM Unit Risk Factor	300 excess cancers/$\mu g/m^3$

1. The low end of the breathing rate range is the mean of the OEHHA breathing rate distribution and the high end is the 95th percentile of the distribution

Results

We have included three sets of tables, one set for each modeled horsepower (200, 500, and 1500). Each set of tables contains five sub-tables, one for each emission factor (0.01, 0.15, 0.40, 0.55 and 1.0 g/bhp-hr). Each emission factor table comprises a matrix of downwind distances and hours of operation, with the calculated risks for each combination. The low-end and high-end of the risks presented in the tables are corresponding to the 65th (mean) and 95th percentile breathing rates, respectively. Additionally, the tables are coded using varied levels of shading. The moderately shaded squares denote the low-end potential cancer risks of between one and ten per one million people. The darkest squares show the low-end risk levels between 11 and 100 potential cancer cases per million. The white squares show the highest calculated risks, those exceeding 100 potential cases per million people. As can be seen, the estimated cancer risk from stationary diesel-fueled engines varies depending on the emission rate, horsepower and annual hours of operation for a given engine.

Estimated risk as a function of emission factor:

For the range of engine horsepowers modeled, all those engines that emitted 0.01 g/bhp-hr or less could run at least 1000 hours per year without exceeding the lowest range of estimated risks, those of 10 or less potential cancer cases per year.

For the 0.15 g/ bhp-hr engines, most combinations of horsepower, hours of operation and downwind distance did not exceed the lowest range of risks, with those combinations resulting in the higher risk ranges occurring at 200-plus operating hours and low to moderate downwind distances.

For engines with emissions of 0.4 g/bhp-hr or more the trend was to find higher risks at low to moderate downwind distances and longer operating times continues, with the proportion of moderate to high risk level results increasing as emission factors increase.

Estimated risk as a function of hours of operation:

Generally, as the hours of operation increased, the number of engines that exceeded the lowest risk range increased. However, most engines could operate for 10 to 20 hours per year without exceeding the lowest range of risk.

Estimated risk as a function of horsepower:

For the engine configurations evaluated in these scenarios, the smaller horsepower engine (200 hp), typically demonstrated higher near source risk for a given number of hours of operation than the larger engines. In addition, the potential cancer risk reached the point of maximum impact more rapidly for the 200 hp engine than the larger engines. The larger engines had the point of maximum impact further from the engine due to the greater plume dispersion that occurs with the large horsepower engines.

Table Set 1: Diesel Exhaust PM Risk (Potential Cancer Cases in A Million) for 200 HP Engines

	EF = 0.01 g/bhp-hr										
	Downwind Distance (m)										
Hours	30	42	75	100	200	300	400	500	800	1600	3200
10	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0
50	0	0-1	0	0	0	0	0	0	0	0	0
100	1-1	1-1	0-1	0	0	0	0	0	0	0	0
200	1-2	1-2	1-1	0-1	0	0	0	0	0	0	0
300	2-2	2-3	1-2	1-1	0	0	0	0	0	0	0
400	2-3	3-4	2-2	1-1	0	0	0	0	0	0	0
500	3-4	4-5	2-3	1-2	0-1	0	0	0	0	0	0
1000	6-8	7-10	4-5	2-3	1-1	1-1	0-1	0	0	0	0

	EF = 0.15 g/bhp-hr										
	Downwind Distance (m)										
Hours	30	42	75	100	200	300	400	500	800	1600	3200
10	1-1	1-2	1-1	0-1	0	0	0	0	0	0	0
20	2-2	2-3	1-2	1-1	0	0	0	0	0	0	0
30	3-4	3-5	2-2	1-2	0-1	0	0	0	0	0	0
40	3-5	4-6	2-3	1-2	1-1	0	0	0	0	0	0
50	4-6	5-8	3-4	2-3	1-1	0-1	0	0	0	0	0
100	8-12	11-15	6-8	4-5	1-2	1-1	1-1	0-1	0	0	0
200	17-24	21-31	11-16	7-10	3-4	2-2	1-2	1-1	0-1	0	0
300	26-36	32-46	17-25	11-15	4-6	2-3	2-2	1-2	1-1	0-1	0
400	33-49	42-61	23-33	14-20	5-7	3-4	2-3	2-2	1-1	0-1	0
500	42-61	53-76	28-41	18-26	6-9	4-5	3-4	2-3	1-2	1-1	0
1000	84-122	105-153	56-82	35-51	13-18	8-11	5-8	4-6	2-4	1-2	1-1

	EF = 0.40 g/bhp-hr										
	Downwind Distance (m)										
Hours	30	42	75	100	200	300	400	500	800	1600	3200
10	2-3	3-4	2-2	1-1	0	0	0	0	0	0	0
20	4-6	6-8	3-4	2-3	1-1	0-1	0	0	0	0	0
30	7-10	8-12	5-7	3-4	1-1	1-1	0-1	0	0	0	0
40	9-13	11-16	6-9	4-5	1-2	1-1	1-1	0-1	0	0	0
50	11-16	14-20	8-11	5-7	2-2	1-1	1-1	1-1	0	0	0
100	22-32	28-41	15-22	9-14	3-5	2-3	1-2	1-2	1-1	0	0
200	45-65	56-81	30-44	19-27	7-10	4-6	3-4	2-3	1-2	1-1	0
300	67-97	84-122	45-65	28-41	10-15	6-9	4-6	3-5	2-3	1-1	0-1
400	89-130	112-163	60-87	38-55	14-20	8-12	6-8	4-6	3-4	1-2	1-1
500	112-162	140-203	75-109	47-68	17-25	10-15	7-10	6-8	3-5	2-2	1-1
1000	223-324	280-407	150-218	94-137	34-49	20-29	14-21	11-16	7-10	3-5	2-2

	EF = 0.55 g/bhp-hr										
	Downwind Distance (m)										
Hours	30	42	75	100	200	300	400	500	800	1600	3200
10	3-4	4-6	2-3	1-2	0-1	0	0	0	0	0	0
20	6-9	8-11	4-6	3-4	1-1	1-1	0-1	0	0	0	0
30	9-13	12-17	6-9	4-6	1-2	1-1	1-1	0-1	0	0	0
40	12-18	15-22	8-12	5-8	2-3	1-2	1-1	1-1	0-1	0	0
50	15-22	19-28	10-15	6-9	2-3	1-2	1-1	1-1	0-1	0	0
100	31-45	39-56	21-30	13-19	5-7	3-4	2-3	2-2	1-1	0-1	0
200	61-89	77-112	41-60	26-38	9-14	6-8	4-6	3-4	2-3	1-1	0-1
300	92-134	116-168	62-90	39-56	14-20	8-12	6-9	5-7	3-4	1-2	1-1
400	123-178	154-224	83-120	52-75	19-27	11-16	8-11	6-9	4-5	2-3	1-1
500	153-223	193-280	103-150	65-94	23-34	14-20	10-14	8-11	5-7	2-3	1-2
1000	307-448	385-559	206-300	129-188	47-68	28-40	20-29	15-22	9-13	4-6	2-3

	EF = 1.0 g/bhp-hr										
	Downwind Distance (m)										
Hours	30	42	75	100	200	300	400	500	800	1600	3200
10	6-8	7-10	4-5	2-3	1-1	1-1	0-1	0	0	0	0
20	11-16	14-20	8-11	5-7	2-2	1-1	1-1	1-1	0	0	0
30	17-24	21-31	11-16	7-10	3-4	2-2	1-2	1-1	0-1	0	0
40	22-32	28-41	15-22	9-14	3-5	2-3	1-2	1-2	1-1	0	0
50	28-41	35-51	19-27	12-17	4-6	3-4	2-3	1-2	1-1	0-1	0
100	56-81	70-102	38-56	23-34	8-12	5-7	4-5	3-4	2-2	1-1	0-1
200	112-162	140-203	75-100	47-68	17-25	10-15	7-10	6-8	3-5	2-2	1-1
300	167-243	210-305	113-164	70-102	25-37	15-22	11-16	8-12	5-7	2-3	1-2
400	223-324	280-407	150-218	94-137	34-49	20-29	14-21	11-16	7-10	3-5	2-2
500	279-405	350-508	188-273	117-171	42-62	25-37	18-26	14-20	8-12	4-6	2-3
1000	558-810	700-1017	375-545	235-341	85-123	50-73	36-52	28-40	16-24	8-11	4-6

Note:

1. The low-end risk is based on the mean breathing rate and high-end risk is based on the 95th percentile breathing rate. These risk values assume an exposure duration of 70 years for nearby residents;
2. Light Shading shows the potential cancer risk >= 10/million; Dark Shading shows the risk betwee 10 and 100 per million; No Shading shows the risk greater than 100 per million.

Table Set 2: Diesel Exhaust PM Risk (Potential Cancer Cases in A Million) for 550 HP Engines

	EF = 0.01 g/bhp-hr										
	Downwind Distance (m)										
Hours	30	50	70	100	200	300	400	500	800	1600	3200
10	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0-1	0	0	0	0	0	0	0	0
100	0	1-1	1-1	0-1	0	0	0	0	0	0	0
200	0	1-1	1-1	1-1	0	0	0	0	0	0	0
300	1-1	1-1	1-2	1-1	0-1	0	0	0	0	0	0
400	1-1	1-2	2-2	1-2	0-1	0	0	0	0	0	0
500	1-1	2-2	2-3	2-2	1-1	0	0		0	0	0
1000	2-2	3-5	4-6	3-5	1-2	1-1	0-1	0-1	0	0	0

	EF = 0.15 g/bhp-hr										
	Downwind Distance (m)										
Hours	30	50	70	100	200	300	400	500	800	1600	3200
10	0	1-1	1-1	0-1	0	0	0	0	0	0	0
20	1-1	1-1	1-2	1-1	0-1	0	0	0	0	0	0
30	1-1	2-2	2-3	1-2	1-1	0	0	0	0	0	0
40	1-1	2-3	2-4	2-3	1-1	0-1	0	0	0	0	0
50	1-2	3-4	3-4	2-4	1-1	1-1	0-1	0	0	0	0
100	3-4	5-7	6-9	5-7	2-3	1-1	1-1	1-1	0	0	0
200	5-7	10-15	12-18	10-14	4-5	2-3	1-2	1-2	1-1	0	0
300	8-11	15-22	18-27	14-21	5-8	3-4	2-3	2-2	1-1	0-1	0
400	10-15	20-30	25-36	19-28	7-10	4-6	3-4	2-3	1-2	1-1	0
500	13-18	25-37	31-45	24-35	9-13	5-7	4-5	3-4	2-2	1-1	0-1
1000	25-37	51-74	61-89	48-70	18-26	10-15	7-10	5-8	3-5	1-2	1-1

	EF = 0.40 g/bhp-hr										
	Downwind Distance (m)										
Hours	30	50	70	100	200	300	400	500	800	1600	3200
10	1-1	1-2	2-2	1-2	0-1	0	0	0	0	0	0
20	1-2	3-4	3-5	3-4	1-1	1-1	0-1	0	0	0	0
30	2-3	4-6	5-7	4-6	1-2	1-1	1-1	0-1	0	0	0
40	3-4	5-8	7-9	5-7	2-3	1-2	1-1	1-1	0	0	0
50	3-5	7-10	8-12	6-9	2-3	1-2	1-1	1-1	0-1	0	0
100	7-10	14-20	16-24	13-19	5-7	3-4	2-3	1-2	1-1	0-1	0
200	14-20	27-40	33-47	26-37	10-14	5-8	4-5	3-4	2-2	1-1	0-1
300	20-29	41-59	49-71	39-56	14-21	8-12	6-8	4-6	2-4	1-2	1-1
400	27-39	54-79	65-95	52-75	19-28	11-16	8-11	6-8	3-5	2-2	1-1
500	34-49	68-99	82-119	64-94	24-35	14-20	9-14	7-10	4-6	2-3	1-1
1000	68-98	136-198	163-237	129-187	48-70	27-40	19-27	14-21	8-12	4-6	2-3

	EF = 0.55 g/bhp-hr										
	Downwind Distance (m)										
Hours	30	50	70	100	200	300	400	500	800	1600	3200
10	1-1	2-3	2-3	2-3	1-1	0-1	0	0	0	0	0
20	2-3	4-5	4-7	4-5	1-2	1-1	1-1	0-1	0	0	0
30	3-4	6-8	7-10	5-8	2-3	1-2	1-1	1-1	0	0	0
40	4-5	7-11	9-13	7-10	3-4	2-2	1-2	1-1	0-1	0	0
50	5-7	9-14	11-16	9-13	3-5	2-3	1-2	1-1	1-1	0	0
100	9-14	19-27	22-33	18-26	7-10	4-5	3-4	2-3	1-2	1-1	0
200	19-27	37-54	45-65	35-51	13-19	8-11	5-8	4-6	2-3	1-2	1-1
300	28-41	56-81	67-96	53-77	20-29	11-16	8-11	6-9	3-5	2-2	1-1
400	37-54	75-109	90-131	71-103	26-38	15-22	10-15	8-11	5-7	2-3	1-2
500	46-68	93-136	112-163	89-129	33-48	19-27	13-19	10-14	6-9	3-4	1-2
1000	93-135	187-272	225-326	177-257	66-96	38-55	26-38	20-29	11-17	5-8	3-4

	EF = 1.0 g/bhp-hr										
	Downwind Distance (m)										
Hours	30	50	70	100	200	300	400	500	800	1600	3200
10	2-2	3-5	4-6	3-5	1-2	1-1	0-1	0-1	0	0	0
20	3-5	7-10	8-12	6-9	2-3	1-2	1-1	1-1	0-1	0	0
30	5-7	10-15	12-18	10-14	4-5	2-3	1-2	1-2	1-1	0	0
40	7-10	14-20	16-24	13-19	5-7	3-4	2-3	1-2	1-1	0-1	0
50	8-12	17-25	20-30	16-23	6-9	3-5	2-3	2-3	1-2	0-1	0
100	17-26	34-49	41-59	32-47	12-17	7-10	5-7	4-5	2-3	1-1	0-1
200	34-49	66-99	82-119	64-94	24-35	14-20	9-14	7-10	4-6	2-3	1-1
300	51-74	102-148	123-178	97-140	36-52	21-30	14-21	11-16	6-9	3-4	1-2
400	68-98	136-198	163-237	129-187	48-70	27-40	19-27	14-21	8-12	4-6	2-3
500	85-123	170-247	204-297	161-234	60-87	34-50	24-34	18-26	10-15	5-7	2-3
1000	169-246	340-494	409-593	322-468	120-175	68-99	47-69	36-52	21-30	10-14	5-7

Note:

1. The low-end risk is based on the mean breathing rate and high-end risk is based on the 95th percentile breathing rate. These risk values assume an exposure duration of 70 years for nearby residents;
2. Light Shading shows the potential cancer risk >= 10/million; Dark Shading shows the risk betwee 10 and 100 per million; No Shading shows the risk greater than 100 per million.

Table Set 3: Diesel Exhaust PM Risk (Potential Cancer Cases in A Million) for 1500 HP Engines

	EF = 0.01 g/bhp-hr										
	Downwind Distance (m)										
Hours	30	50	100	132	200	300	400	500	800	1600	3200
10	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0-1	0	0	0	0	0	0	0	0
200	0	0	1-1	1-1	1-1	0	0	0	0	0	0
300	0	0	1-2	1-2	1-1	0-1	0	0	0	0	0
400	0	0-1	1-2	2-2	1-2	1-1	0-1	0	0	0	0
500	0	1-1	2-3	2-3	1-2	1-1	0-1	0	0	0	0
1000	1-1	1-2	4-5	4-6	3-4	1-2	1-1	1-1	0	0	0

	EF = 0.15 g/bhp-hr										
	Downwind Distance (m)										
Hours	30	50	100	132	200	300	400	500	800	1600	3200
10	0	0	1-1	1-1	0-1	0	0	0	0	0	0
20	0	0	1-2	1-2	1-1	0-1	0	0	0	0	0
30	0	0-1	2-2	2-3	1-2	1-1	0-1	0	0	0	0
40	0	1-1	2-3	3-4	2-2	1-1	1-1	0-1	0	0	0
50	0-1	1-1	3-4	3-5	2-3	1-2	1-1	0-1	0	0	0
100	1-1	2-2	5-8	6-9	4-6	2-3	1-2	1-1	0-1	0	0
200	2-2	3-5	11-16	13-19	9-12	4-6	3-4	2-3	1-1	0-1	0
300	2-3	5-7	16-23	19-26	13-19	6-9	4-6	3-4	1-2	1-1	0
400	3-4	7-10	21-31	26-37	17-25	9-12	5-8	4-5	2-3	1-1	0-1
500	4-6	8-12	26-38	32-47	21-31	11-16	7-10	5-7	2-4	1-2	1-1
1000	8-11	17-24	53-77	64-93	43-62	21-31	13-19	9-14	5-7	2-3	1-1

	EF = 0.40 g/bhp-hr										
	Downwind Distance (m)										
Hours	30	50	100	132	200	300	400	500	800	1600	3200
10	0	0-1	1-2	2-2	1-2	1-1	0-1	0	0	0	0
20	0-1	1-1	3-4	3-5	2-3	1-2	1-1	1-1	0	0	0
30	1-1	1-2	4-6	5-7	3-5	2-2	1-2	1-1	0-1	0	0
40	1-1	2-3	6-8	7-10	5-7	2-3	1-2	1-1	1-1	0	0
50	1-1	2-3	7-10	9-12	6-8	3-4	2-3	1-2	1-1	0	0
100	2-3	4-6	14-20	17-25	11-16	6-8	4-5	3-4	1-2	1-1	0
200	4-6	9-13	28-41	34-50	23-33	11-16	7-10	5-7	3-4	1-2	1-1
300	6-9	13-19	42-61	51-75	34-50	17-25	11-15	8-11	4-6	2-3	1-1
400	8-12	18-26	56-82	68-99	46-67	23-33	14-21	10-15	5-8	2-3	1-2
500	10-15	22-32	70-102	86-124	57-83	28-41	18-26	13-18	7-10	3-4	1-2
1000	20-30	44-64	141-204	171-249	114-166	57-83	35-51	25-37	13-19	6-8	3-4

	EF = 0.55 g/bhp-hr										
	Downwind Distance (m)										
Hours	30	50	100	132	200	300	400	500	800	1600	3200
10	0	1-1	2-3	2-3	2-2	1-1	0-1	0-1	0	0	0
20	1-1	1-2	4-6	5-7	3-5	2-2	1-1	1-1	0-1	0	0
30	1-1	2-3	6-8	7-10	5-7	2-3	1-2	1-2	1-1	0	0
40	1-2	2-4	8-11	9-14	6-9	3-5	2-3	1-2	1-1	0	0
50	1-2	3-4	10-14	12-17	8-11	4-6	2-4	2-3	1-1	0-1	0
100	3-4	6-9	19-26	24-34	16-23	8-11	5-7	3-5	2-3	1-1	0-1
200	6-8	12-18	39-56	47-68	31-46	16-23	10-14	7-10	4-5	2-2	1-1
300	8-12	16-27	58-84	71-103	47-69	23-34	15-21	10-15	5-8	2-3	1-2
400	11-16	24-35	77-112	94-137	63-91	31-45	19-28	14-20	7-11	3-5	1-2
500	14-20	30-44	97-140	118-171	79-114	39-57	24-35	17-25	9-13	4-6	2-3
1000	28-41	61-89	193-281	235-342	157-229	78-114	49-71	35-50	19-26	8-11	4-5

	EF = 1.0 g/bhp-hr										
	Downwind Distance (m)										
Hours	30	50	100	132	200	300	400	500	800	1600	3200
10	1-1	1-2	4-5	4-6	3-4	1-2	1-1	1-1	0	0	0
20	1-1	2-3	7-10	9-12	6-8	3-4	2-3	1-2	1-1	0	0
30	2-2	3-5	11-16	13-19	9-12	4-6	3-4	2-3	1-1	0-1	0
40	2-3	4-6	14-20	17-25	11-16	6-8	4-5	3-4	1-2	1-1	0
50	3-4	6-8	18-26	21-31	14-21	7-10	4-6	3-5	2-2	1-1	0
100	5-7	11-16	35-51	43-62	29-42	14-21	9-13	6-9	3-5	1-2	1-1
200	10-15	22-32	70-102	86-124	57-83	28-41	18-26	13-18	7-10	3-4	1-2
300	15-22	33-48	106-153	128-186	85-125	43-62	27-39	19-27	10-14	4-6	2-3
400	20-30	44-64	141-204	171-249	114-166	57-83	35-51	25-37	13-19	6-8	3-4
500	25-37	55-80	176-255	214-311	143-208	71-103	44-64	32-46	17-24	7-10	3-5
1000	51-74	111-161	352-511	428-622	286-416	142-206	88-128	63-92	33-48	14-20	7-10

Note:

1. The low-end risk is based on the mean breathing rate and high-end risk is based on the 95th percentile breathing rate. These risk values assume an exposure duration of 70 years for nearby residents;
2. Light Shading shows the potential cancer risk <= 10/million; Dark Shading shows the risk betwee 10 and 100 per million; No Shading shows the risk greater than 100 per million.

REFERENCES:

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Appendix F

Basis for the Diesel PM Standards

Introduction

This appendix presents the basis for the diesel particulate matter (PM) limits established in the proposed *Stationary Diesel-Fueled Engine Airborne Toxic Control Measure* (ATCM).

The diesel PM emission limits established for engines greater than 50 horsepower are summarized in Table F-1. The diesel PM emission limit for engines less than or equal to 50 hp is equal to the applicable Off-Road Compression-Ignition Engine Standards (Title 13, CCR, section 2423). Altogether, there are six different diesel PM limits established by the ATCM. Each limit represents the application of what ARB staff considers the best available control technology (BACT) for a specific category of engine and engine use. Factors that influence what "best available control technology" means for a specific category and use of engine include potential near source risk, cost of controls, the availability of control technologies that can be used to meet these limits, and the availability of new engines that can meet these limits. The following paragraphs explain ARB staff's rationale for establishing these each of these limits.

Table F-1: Diesel PM Limits for Engines Greater than 50 Horsepower

Diesel PM Emission Limit	Applicability						Comments/Notes
	Prime		E/S		Agricultural		
	New	In-Use	New	In-Use	New	In-Use	
None				X			• For E/S: Annual maintenance and testing hours limited to 20 or less
≤0.40				X			• For E/S: Annual maintenance and testing hours limited to 30 or less
≤0.15			X	X	X		• For E/S: Annual maintenance and testing hours limited to 50 or less
≤0.01	X	X	X	X			• For E/S: Annual maintenance and testing hours limited to 100 or less
30% reduction from baseline levels		X					• For Prime: Must meet 0.01 g/bhp-hr by 2011
85% reduction from baseline levels		X					

Diesel PM Limit: None (No diesel PM limit established)

To what engine applications does this diesel PM limit apply?

In-use emergency standby engines that are operated less than or equal to 20 hours per year for maintenance and testing purposes.

Why is this limit appropriate for these applications?

For in-use engines, those that have been installed at a facility on or before January 1, 2005, the most cost effective approaches to reducing the risk to acceptable levels is to limit the hours of operation. ARB staff knows from reviewing air dispersion modeling (see Appendix E, Stationary Diesel-Fueled Engines, Health Risk Assessment Methodology) results that engine horsepower or size does not have as significant an impact on the maximum offsite risk as does diesel PM emission rate and hours of operation. Our modeling showed that most engines could operate for 10 to 20 hours per year without exceeding a potential cancer case threshold of 10 potential cancer cases per million.

The results from the ARB survey of emergency standby diesel-fueled CI engines in California indicate that on average a typical stationary engine operates approximately 20 hours per year for maintenance and testing, with 95 percent of the engines operating 50 hours or less for maintenance and testing purposes (See Appendix B, Stationary Emergency Standby Diesel-Fueled Engine Survey). From this data, ARB staff concludes that it is technically feasible to reduce hours of operation for maintenance and testing to below 20 hours per year. Results from that same survey indicate that on average an emergency standby engine operates 7 hours per year for emergency use, with over 80 percent of the engines operating 10 hours or less for emergency use. Therefore, ARB staff believes a limit on maintenance and testing hours of operation is appropriate because these hours of operation are planned hours of operation and represent the mode of operation where the most hours are accumulated. The owner or operator has control over how long these engines are run in this mode, while emergency use hours by definition are unplanned and are typically much less than the scheduled hours of operation for maintenance and testing.

Diesel PM Limit: 0.40 g/bhp-hr

To what engine applications does this diesel PM limit apply?

In-use emergency standby engines that are operated less than or equal to 30 hours per year for maintenance and testing purposes.

Why is this limit appropriate for these applications?

Although the reduction in planned hours of operation is the simplest and most cost effective way to reduce the risk in-use emergency standby engines, ARB staff recognizes that there may be specific applications that require more than 20 hours of operation per year for maintenance and testing. Therefore, ARB staff has established requirements that consist of both emission limits and limits on annual hours of operation. Our air dispersion modeling shows that most engines that emit diesel PM at an emission rate of 0.40 g/bhp-hr could operate for up to 30 hours per year without exceeding a potential cancer case threshold of about 10 potential cancer cases per million at the point of maximum impact.

As discussed in the previous subsection, ARB survey data indicates that is technically feasible for many owners to reduce their hours of operation for maintenance and testing to below 30 hours per year, and that a limit on maintenance and testing hours of operation is appropriate because these hours of operation are planned hours of operation and represent the mode of operation where the most hours are accumulated. The owner or operator has control over how long these engines are run in this mode, while emergency use hours by definition are unplanned and are typically much less than the scheduled hours of operation for maintenance and testing.

Is the 0.40 g/bhp-hr diesel PM emission limit technologically achievable?

The 0.40 g/bhp-hr is technologically achievable because:

- Off-road Certified Engines with horsepower ratings from 100 to 175 have been required to meet a 0.22 g/bhp-hr standard since 2003.
- Off-road Certified Engines with horsepower ratings from 175 to 750 have been required to meet a 0.40 g/bhp-hr standard since 1996.
- Off-road Certified Engines with horsepower ratings greater than 750 have been required to meet a 0.40 g/bhp-hr standard since 2000.
- Three pre-1996 model year engines were tested for diesel PM emission rate as part of the ARB/CE-CERT Diesel PM Control Technology Demonstration. All three engines emitted diesel PM at levels below 0.40 g/bhp-hr, the highest being 0.19 g/bhp-hr.
- Diesel PM emission test results from the ARB/CE-CERT Diesel PM Control Technology Demonstration (see appendix H, Control Technology Demonstration.) and independent testing have shown diesel oxidation catalyst (DOC) technology can reduce diesel PM emissions from 20 to 30 percent. A typical uncontrolled diesel-fueled engine currently operating in California emits between 0.50 and 0.60 g/bhp-hr of diesel PM. An engine with a baseline diesel PM emission rate of 0.55 would be able to meet the 0.40 g/bhp-hr standard if it installed a DOC with a reduction efficiency of 27 percent.

Diesel PM Limit: 0.15 g/bhp-hr

To what engine applications does this diesel PM limit apply?

- New and in-use emergency standby engines that are operated less than or equal to 50 hours per year for maintenance and testing purposes.
- New agricultural engines.

Why is this limit appropriate for these applications?

New and In-Use Emergency Standby Engine Applications

As discussed in the previous subsection, ARB staff's approach in defining BACT for in-use emergency standby engine applications has been to establish emission rate limits and planned hours of operation limits that, together, result in an acceptable level of risk. Our air dispersion modeling shows that most engines that emit diesel PM at an emission rate of 0.15 g/bhp-hr could operate for up to 50 hours per year without exceeding a potential cancer case threshold of 10 potential cancer cases per million. For all new emergency standby engines, those installed after January 1, 2005, the 0.15 g/bhp-hr standard is appropriate, because new engines meeting this standard are currently available "off-the-shelf".

As discussed in the previous subsection, ARB survey data indicates that is technically feasible for many owners to reduce their hours of operation for maintenance and testing to well below 50 hours per year, and that a limit on maintenance and testing hours of operation is appropriate because these hours of operation are planned hours of operation and represent the mode of operation where the most hours are accumulated. The owner or operator has control over how long these engines are run in this mode, while emergency use hours by definition are unplanned and are typically much less than the scheduled hours of operation for maintenance and testing.

Agricultural Engines

The proposed ATCM establishes performance standards for new agricultural engines similar to new emergency standby engines, but without hour of operation restrictions for agricultural engines that are used in as emergency standby engines. Both new emergency standby and new prime engines used in agricultural operations are required to meet the 0.15 g/bhp-hr diesel PM emission limit. The "cleanest" off-road certified engines currently produced meet the 0.15 g/bhp-hr diesel PM certification level. Requiring agricultural engines to meet more stringent standards would mean the application of retrofit technologies. At this time, ARB staff believes that it is not appropriate to require the application of diesel PM emission control retrofit technologies on new or in-use agricultural

engines. The reasons for this include the current lack of off-the-shelf retrofit control technology kits that could easily be installed by individual farmers; implementation and enforcement constraints resulting from the current lack of permitting requirements for agricultural engines; and the potential for creating disincentives to replacing or discontinuing the use of older, dirtier engines

A major factor in staff's decision not to require retrofit controls for new or in-use agricultural engines is retrofit installation and availability issues. Engine manufacturers currently are not producing engines with add-on PM controls for off-road applications. The purchaser of a new agricultural engine would have to arrange to have retrofit controls installed after purchase. It would be very difficult for the individual farmer or the local engine dealer to arrange for installation of retrofit controls since it is currently not an option offered by the engine manufacturer. Staff believes that to successfully implement retrofits requirements for engines in agricultural service, bolt-on retrofit kits design by the engine manufactured will be needed.

In addition to the retrofit installation and availability issue, there is an implementation and enforcement issue regarding new and in-use agricultural engines. Health and Safety Code section 42310 exempts any equipment used in agricultural operations from having to obtain a permit. Staff believes that it would be extremely difficult and resource intensive to implement retrofit control requirements without a permitting system. Requiring a permit provides a mechanism for obtaining critical data on engine location, make/model, model year, horsepower, and operating hours. More importantly, it provides an enforceable mechanism for the district to obtain the information necessary to determine if the selected equipment is capable of meeting the requirements of the ATCM. Because of the permitting restriction, staff believes that the best approach is to require new agricultural engine to meet the lowest achievable off-road engine standards and to not require retrofits on in-use agricultural engines.

Finally, staff is also concerned that requiring retrofit control for new engines would provided a disincentive for replacing older, dirtier engines. Currently a large number of older agricultural engines have been replaced with newer engines meeting the 0.15 g/bhp-hr PM standard under the Carl Moyer program. Requiring retrofit controls would increase the cost of a new engine by 25 to 40 percent, making it less likely that older engines would be replaced. Requiring retrofit controls would also require more Moyer funds to be spent on fewer engines. Due to increased costs, we believe that requiring retrofit controls on in-use engines may make it less likely that these engines will be removed from service and replaced with electric power. We believe that replacing diesel engines with electric power may be the best long term approach for reducing PM and NOx emission from stationary agricultural engines.

Is the 0.15 g/bhp-hr diesel PM emission limit technologically achievable?

The 0.15 g/bhp-hr is technologically achievable because

- Newly manufactured off-road engines less than 175 hp are held to less stringent standards, but certification data indicate that approximately 18 percent of the off-road certified engines emitted diesel PM at a rate less than or equal to 0.15 g/bhp-hr.
- Off-road Certified Engines with horsepower ratings from 175 to 299 have been required to meet a 0.15 g/bhp-hr standard since 2003.
- Off-road Certified Engines with horsepower ratings from 300 to 599 have been required to meet a 0.15 g/bhp-hr standard since 2000.
- Off-road Certified Engines with horsepower ratings greater than 600 to 750 have been required to meet a 0.15 g/bhp-hr standard since 2002.
- Seven stationary diesel-fueled engines were tested for diesel PM emission rate as part of the ARB/CE-CERT Diesel PM Control Technology Demonstration (see Appendix H, Control Technology Demonstration). Of the seven, two of the engines emitted diesel PM at a rate less than or equal to 0.15 g/bhp-hr. The remaining five were retrofitted with different diesel PM control technologies. These control technologies included emulsified fuels, active and passive diesel particulate filter systems, and diesel oxidation catalysts. All five engines were tested after the control technologies were implemented and all five engines emitted diesel PM at levels below 0.15 g/bhp-hr.

Diesel PM Limit: 0.01 g/bhp-hr

To what engine applications does this diesel PM limit apply?

- New and in-use emergency standby engines that are operated less than or equal to 100 hours per year for maintenance and testing purposes.
- New and in-use prime engines

Why is this limit appropriate for these applications?

<u>New and In-Use Emergency Standby Engine Applications</u>

As discussed in the previous subsections, ARB staff's approach in defining BACT for new and in-use emergency standby engine applications has been to establish emission rate limits and planned hours of operation limits that, together, result in an acceptable level of risk. Our air dispersion modeling shows that most engines that emit diesel PM at an emission rate of 0.01 g/bhp-hr could operate for up to 100 hours per year without exceeding a potential cancer case threshold of about one potential cancer case per million.

As discussed in the previous subsection, ARB survey data indicates that is technically feasible for many owners to reduce their hours of operation for maintenance and testing to well below 100 hours per year, and that a limit on maintenance and testing hours of operation is appropriate because these hours of operation are planned hours of operation and represent the mode of operation where the most hours are accumulated. The owner or operator has control over how long these engines are run in this mode, while emergency use hours by definition are unplanned and are typically much less than the scheduled hours of operation for maintenance and testing.

New and In-Use Prime Engines

Defining BACT for prime engine applications differs from emergency standby applications because prime engines have no limit on their hours of operation. Therefore, ARB staff had to establish BACT based solely on diesel PM emission rate. Our air dispersion modeling shows that most engines that emit diesel PM at an emission rate of 0.01 g/bhp-hr could operate for up to 1000 hours per year without exceeding a potential cancer case threshold of about 10 potential cancer case per million. According to survey response information, the average hours of operation for a stationary prime diesel-fueled CI engine is approximately 1000 hours per year. (See Appendix C, Stationary Prime Diesel-Fueled Engine Survey.)

Is the 0.01 g/bhp-hr diesel PM emission limit technologically achievable?

The 0.01 g/bhp-hr is technologically achievable because

- Two stationary diesel-fueled engines that were tested for diesel PM emission rate as part of the ARB/CE-CERT Diesel PM Control Technology Demonstration were able to achieve a diesel PM emission rate of equal to or less than 0.01 g/bhp-hr through the application of DPF technologies.
- In support of its Verification application to the ARB, CleanAIR Systems has submitted diesel-fueled CI engine emission test data that shows its Passive DPF technology, the PERMIT technology, is capable of diesel PM emission rate reductions of 85 percent and greater, and has resulted in reducing diesel-fueled CI engine emission rates to below 0.01 g/bhp-hr. (ARB, 2003)

Diesel PM Limit: 30 percent reduction from baseline levels

To what engine applications does this diesel PM limit apply?

- In-use prime engines that are not certified in accordance with the Off-Road Compression Ignition Engine Standards (title 13, CCR, section 2423).

Why is this limit appropriate for these applications?

The "30 percent reduction, by weight, from baseline levels" option is one part of a two-part standard that is applicable only to in-use, uncertified engines. Owners that choose this option for compliance are required to meet the 30 percent reduction by no later than January 1, 2006, and then meet a more stringent standard of 0.01 g/bhp-hr by July 1, 2003. ARB staff believes this option will be used by owners of older, uncertified engines that may have difficulty in meeting the 85 percent reduction requirement by the compliance dates specified in the proposed ATCM. This is especially true of older, two-stroke engines with baseline diesel PM emission rates above 0.40 g/bhp-hr, relatively cooler average exhaust temperatures (less than 300 C) and relatively higher fractions (above 30 percent) of the diesel PM comprised of soluble organics. Owners of these engines may opt to reduce their diesel PM emissions by at least 30 percent through the application of diesel emission control systems that are based on the use of a diesel oxidation catalyst. (DieselNet, 2002)

Although the short-term risk from engines that choose to meet this two-part standard will be greater than those that meet the 85 percent reduction limit by the compliance dates specified in the proposed ATCM (January 2006-2009), ARB staff's believes the additional risk reductions associated with reducing the diesel PM emission rate of these engines to 0.01 g/bhp-hr by 2011 will result in an overall reduction in risk benefit over the lifetime of the engine.

Is the 30 percent reduction diesel PM emission standard technologically achievable?

The 30 percent reduction, by weight, diesel PM standard is technologically achievable because:

- A 1985 two-stroke Detroit Diesel V92 equipped with a diesel oxidation catalyst was tested as part of the ARB/CE-CERT Diesel PM Control Technology Demonstration, and was able to achieve a diesel PM emission rate reduction of 47 percent, by weight. (See Appendix H, Control Technology Demonstration.)
- Diesel oxidation catalysts are the most common currently used form of diesel aftertreatment technology and have been used for compliance with the PM standards for on-highway diesel-fueled engines since the early 1990's.

Diesel PM Limit: 85 percent reduction from baseline levels

To what engine applications does this diesel PM limit apply?

- In-use prime engines

Why is this limit appropriate for these applications?

In establishing the diesel PM emission standards for in-use prime engines, ARB staff recognized that not all of these engines will be able to meet the 0.01 g/bhp-hr emission standard. Although the ARB/CE-CERT Diesel PM Control Technology Demonstration and the Verification program has shown that the 0.01 g/bhp-hr emission standard is achievable by in-use engines retrofitted with diesel particulate filter technologies, these engines had baseline diesel PM emission rates that were 0.15 g/bhp-hr and less. (See Appendix H, Control Technology Demonstration.) For engines with emission rates that are greater than 0.15 g/bhp-hr., the 0.01 g/bhp-hr standard may not be achievable. However, ARB staff believes that an 85 percent reduction in diesel PM emission rates is achievable for most in-use diesel-fueled engines. This is consistent with the test information summarized in the Risk Reduction Plan to Reduce Particulate Emissions from Diesel-Fueled Engines and Vehicles, October 2000.

Is the 85 percent reduction, by weight, PM emission limit technologically achievable?

- In support of its Verification application to the ARB, CleanAIR Systems has submitted diesel-fueled CI engine emission test data that shows its Passive DPF technology, the PERMIT technology, is capable of diesel PM emission rate reductions of 85 percent and greater, and has resulted in reducing diesel-fueled CI engine emission rates to below 0.01 g/bhp-hr.
- Two stationary diesel-fueled engines that were tested for diesel PM emission rate as part of the ARB/CE-CERT Diesel PM Control Technology Demonstration were able to achieve a diesel PM emission rate reduction of at least 85 percent, by weight, through the application of DPF technologies.

REFERENCES:

California Air Resources Board. *Letter from Robert H. Cross, Mobile Source Control Division, to Dr. Mike Tripodi, CleanAIR Systems, Reference # RAS-03-19*; June 6, 2003. (ARB, 2003)

DieselNet. *Technology Guide: Diesel Oxidation Catalyst*; 2002. (DieselNet, 2002)

Appendix G

Test Method Workgroup

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I. Background

During the development of the proposed air toxic control measure (ATCM), several concerns were raised regarding the inconsistencies between test methods used to certify off-road engines and the methods commonly used by air pollution control districts to measure emissions from stationary engines. Filter-based test methods for diluted exhaust (off-road methods) have been standard for mobile and off-road engines, while stationary source methods have been the standard for new source review, compliance and permitting of stationary engines. Stationary source or compliance test methods include filterable and condensable components from undiluted exhaust. Since engine certification and verification programs typically require filter-based methods on diluted exhaust, the emission results do not correlate with and generally can not be used to compare with stationary source compliance test results used in permitting and new source reviews.

To better understand the technical issues, a Test Method Working Group was created. The goals of the workgroup were to compare the two sampling approaches and make recommendations for a test method that could be used to demonstrate compliance with the ATCM. The workgroup consisted of members from district staff representing California Air Pollution Control Officers Association (CAPCOA/District), Engine Manufacturers Association (EMA), Manufacturers of Emission Controls Association (MECA), engine manufacturers including Caterpillar and Cummins, Air Resources Board (ARB) and UC Riverside's Center for Environmental Research and Technology (UCR CE-CERT)
In addition, the workgroup addressed issues with ARB Method 5 raised by engine and control device manufactures as follows (EMA, 2002):

- Poor repeatability and test data bias.
- Inadequate accuracy and resolution, especially for the very low levels of particulate matter (PM) emitted with the use of exhaust emission control devices.
- Use of different sampling protocol that effectively result in measurement that has no defined relationship to PM data measured by engine or emission control equipment manufacturers using required certification test methods.
- PM test results that differ from real-world atmospheric particle behavior as compared to dilution measurement methods.
- Use of isokinetic sampling procedures designed for PM size ranges not found in engine emissions.
- A disconnect between the test method required to demonstrate field compliance with the methods and data originally used to develop the CA emissions standards.

In evaluating the use of off-road methods such as the International Organization for Standardization Reciprocating Internal Combustion Engines-Exhaust Emission Measurement (ISO 8178) for stationary source evaluations, the workgroup also addressed the issues of limited field availability and the impact of changing the testing methods for stationary source evaluations. (ISO/DP 8178, 1992)

The two sampling approaches have key differences including exhaust dilution, filter temperatures and condensable components, which result in emission factors that lack correlation. This difference in stationary and off-road test methods makes it difficult to utilize data generated under U.S. EPA Certification Guidance for Engines Regulated Under: 40 CFR Part 86 on-Highway Heavy Duty Engines and 40 CFR Part 89 Nonroad CI Engines (U.S. EPA Nonroad Certification) and ARB Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines (Verification Procedure) programs in stationary source programs. (EPA, 1999) (ARB, 2002) Furthermore, the proposed emission limits and control efficiencies included in this regulation are derived from certification and verifications that utilize filter based dilution off-road methods. The use of existing data for new or retrofitted engines could reduce the need for expensive emission testing to demonstrate compliance with the requirements of this regulation.

To compare the test methods, UCR CE-CERT performed five direct method comparison tests on stationary or portable diesel generators. Table G-1 lists test engine information and fuel sulfur content, (if available) for the test method comparison. The study included comparisons on four baseline (uncontrolled) engines and one engine retrofitted with a passive diesel particulate filter. For the retrofitted engine, both baseline and controlled PM emission factors were measured. In addition, measured control device efficiency was calculated for both test methods.

Table G-1: Test Engine Information and Fuel Sulfur Content

Engine Make/Model	Emission Controls	Test Load 100% load	Fuel (fuel sulfur ppm, if available)
Detroit Diesel 8V-92 1991 2 Stroke	Uncontrolled	2 Stroke 469 hp	CARB Diesel (374 ppm)
Cat 3406B 1991 4 Stroke	Uncontrolled	4 Stroke 422 hp	CARB Diesel (90 ppm)
Detroit Diesel Series 60 1999 4 Stroke	Uncontrolled	4 Stroke 402 hp	CARB Diesel (144 ppm)
Cat 3406 C 2000 4 Stroke	Uncontrolled	4 Stroke 466 hp	CARB Diesel
Cat 3406 C 2000 4 Stroke	Passive DPF	4 Stroke 466 hp	ULSD (< 15 ppm)

II. Test Methods

For stationary source type sampling, ARB Method 5 Determination of Particulate Matter Emissions from Stationary Sources (Method 5 or M5) was used to measure PM and ARB Method 100 Procedures for Continuous Gaseous Emission Stack Sampling (Method 100 or M100) was used to measure gaseous emissions of CO_2, CO, NOx, NO_2, total hydrocarbons (THC). (ARB, 1983) (ARB, 1983a) For the off-road test methods, ISO 8178 was used to measure PM and gaseous emissions of CO_2, CO,

NOx, NO_2, total hydrocarbons (THC) and non-methane hydrocarbons (NMHC). Table G-2 provides an overview of the two test methods. Table G-3 lists the summary continuous emission monitoring systems used to sample gaseous emissions for both ARB Method 100 and ISO 8178.

Table G-2: Overview of Test Methods

Method	ARB Method 5	ISO 8178
Description	Standard stationary engine test method.	Standard test method for off-road testing, certification and verification programs.
Dilution Method	Undiluted exhaust Isokinetic	Diluted exhaust Nonisokinetic or Isokinetic allowed
Filter Component	Filter 248±25 °F (120±14 °C)	Filter Below 125°F (52 °C)
Impinger Component (back half)	Impinger (~60 °F)	No Impinger
Field Availability	Field available	Laboratory or test bed availability Limited field availability
Engine loads	Method does not define test loads	Method defines engine test loads and speeds

Table G-3: Continuous Gaseous Sampling Analyzers

Gaseous Pollutant	Stationary Source Testing Per ARB Method 100	Off Road Testing Per ISO 8178
NOx	Chemiluminescence	Chemiluminescence
NO_2 (see Note 1)	Chemiluminescence	Chemiluminescence
CO	Non-dispersive infrared (NDIR)	Non-dispersive infrared (NDIR)
CO_2	Non-dispersive infrared analyzer	Non-dispersive infrared (NDIR)
Total Hydrocarbons	Flame ionization detector (FID) or non-dispersive infrared analyzer (NDIR)	Flame ionization detector (FID)
CH_4 and Non methane Hydrocarbons (NMHC)	Not analyzed	GC combined with FID to measure CH_4. NMHC from difference between THC and CH_4

Note 1: Speciated NO_2 is not included in either test method. It was included in this study as required by ARB Verification Procedure.

All tests were performed using a 3-mode D1 test cycle and weighting factors as specified in the ISO 8178 Part 4. Load, speed and weighting factors for the ISO 8178 D1 test cycle are listed in Table G-4.

Table G-4: Weighting Factors for ISO 8178 D1 Test Cycle

Mode number	1	2	3	4	5	6	7	8	9	10	11
Torque, %	100	75	50	25	10	100	75	50	25	10	0
Speed	Rated speed					Intermediate speed					Low idle
Type D1	0.30	0.50	0.20								

ARB Method 5

Stationary source type sampling with ARB Method 5 is performed by drawing the raw exhaust directly through a heated filter and a series of impingers in an ice bath. The total PM is composed of the filterable component caught on the filter and the condensable portion caught in the impingers. The total PM catch is itemized by weight as (1) Filter Catch, (2) Probe Catch (3) Impinger Catch and (4) Solvent Extract. The sample is drawn isokinetically from the exhaust stack and through a filter to collect filterable PM. The filter is maintained at a temperature of 248 °F ± 25 °F to ensure that no moisture condenses on the filter. After passing through the filter, the sample gas is drawn through a set of impingers, which are maintained below 68 °F. After sampling for a specified time, the filter is recovered and weighted along with the weight of the particulate from the probe rinse. The filter catch combined with the probe catch (probe wash) is commonly referred to as the front half. The weight of the condensable particulate is determined by recovering the impinger liquid, extraction with methylene chloride and evaporation of the aqueous and methylene chloride extract to determine the condensable PM weight. The condensable portion remaining after evaporation of the aqueous portion is reported as the impinger catch. This portion is also commonly referred to as the inorganic portion of the backhalf. The condensable portion remaining after evaporation of the methylene chloride solvent is reported as the solvent extract. It is commonly referred to as the organic portion of the backhalf. The PM concentration is determined by dividing the weight of the total particulate catch by the volume of gas sampled.

Mass emission rates in grams/hour for particulate and gaseous emissions can be calculated with the average emission concentrations and the stack gas flowrate and moisture content. Stack gas flowrate and moisture content can be determined using ARB Methods 1 Sample and Velocity Traverses for Stationary Sources (Method 1), Method 2 Determination of Stack Gas Velocity and Volumetric Flow Rate (Method 2), Method 3 Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight (Method 3) and Method 4 Determination of Moisture Content in Stack Gasses (Method 4). (ARB, 1993b) (ARB, 1993c) (ARB, 1993d) (ARB, 1993e) Stack gas

velocity is determined from a pitot tube measurement using ARB Methods 1 and 2 allowing computation of the total mass flow rate of diluted exhaust.

ISO 8178

Off-road type sampling is performed by diluting the exhaust with conditioned air and drawing the diluted sample through a particulate filter. PM sampling is done from diluted exhaust gas. This is achieved by turbulent mixing of exhaust gases with air in a dilution tunnel. The total PM is composed of a filterable component only. Off-road type sampling was performed using a 1992 draft version ISO 8178. This older draft version was used since it was directly incorporated by reference into the *California Exhaust Emission Standards and Test Procedures for New 1996 and Later Off-Road Compression-Ignition Engines Part II.* (ARB, 1993)

UCR CE-CERT performed dilution testing with a mobile full-flow constant volume (CVS) sampling laboratory. In the CVS method, the exhaust gases are diluted with air to maintain a constant total flow rate (air + exhaust) under all running conditions. Total exhaust (full-flow) is collected and mixed with air in the full-flow primary dilution tunnel. A sample for particulate measurement is drawn from that tunnel into a small secondary dilution tunnel, further mixed with air and collected on particulate filters maintained at or below 125 °F. Samples for continuous gas phase measurements are drawn from the primary dilution tunnel. The volumetric flow rate is of the diluted exhaust gas is measured using a critical flow venturi and the temperature and pressure of the flow are measured allowing computation of the total mass flow rate of diluted exhaust.

III. Summary of Results

D1 emission factors were calculated using the individual modal data and D1 weighting factors for direct comparison between the ARB Method 5 and ISO 8178 emission tests. The ARB Method 5 emission factors were calculated using the filter only, the front half and the total PM (filter catch, probe catch, impinger catch and solvent extract). Table G-5 lists D1 weighted PM emission factors for ARB Method 5 components and ISO 8178 results. Figure G-1 shows the calculated emission factors for ARB Method 5 filter only, Method 5 front half and ISO 8178. Figure G-2 shows the calculated emission factors for ARB Method 5 total PM and ISO 8178. For each of the test engines, the individual modal emissions for both ARB Method 5 and ISO 8178 testing are shown in Figures G-3 through G-7.

Table G-5: Average D1 Weighted PM Emission Factors for ARB Method 5 and ISO 8178 Test Results

Engine	ARB Method 5 D1 Weighted Emission Factor			ISO 8178 D1 Weighted Emission Factor	Ratio	Ratio
	Filter only	Front Half (Note 1)	TPM		M5 Filter / ISO 8178	M5 TPM / ISO 8178
DD 8V-92	0.125	0.153 (Note 2)	0.475	0.131	0.96	3.64
DD 60 99	0.050	0.060 (Note 2)	0.187	0.057	0.88	3.31
CAT 3406B	0.092	0.112 (Note 2)	0.266	0.111	0.83	2.41
Cat 3406C Baseline	0.123	0.145	0.230	0.110	1.13	2.10
Cat 3406 C DPF Controlled	0.016	0.021	0.060	0.017	0.97	3.52
% reduction Passive DPF	86.7	85.8	74.0	84.5		

Note 1. Front Half includes probe wash and filter weight.
Note 2. Estimated based on results from CAT 3406C baseline and controlled test using average (Front Half)=1.21(Filter Only). Probe wash was not reported separately for these three engines.

Figure G-1: D1 Weighted Emission Factors - M5 Filter, M5 Front Half and ISO 8178 Filter

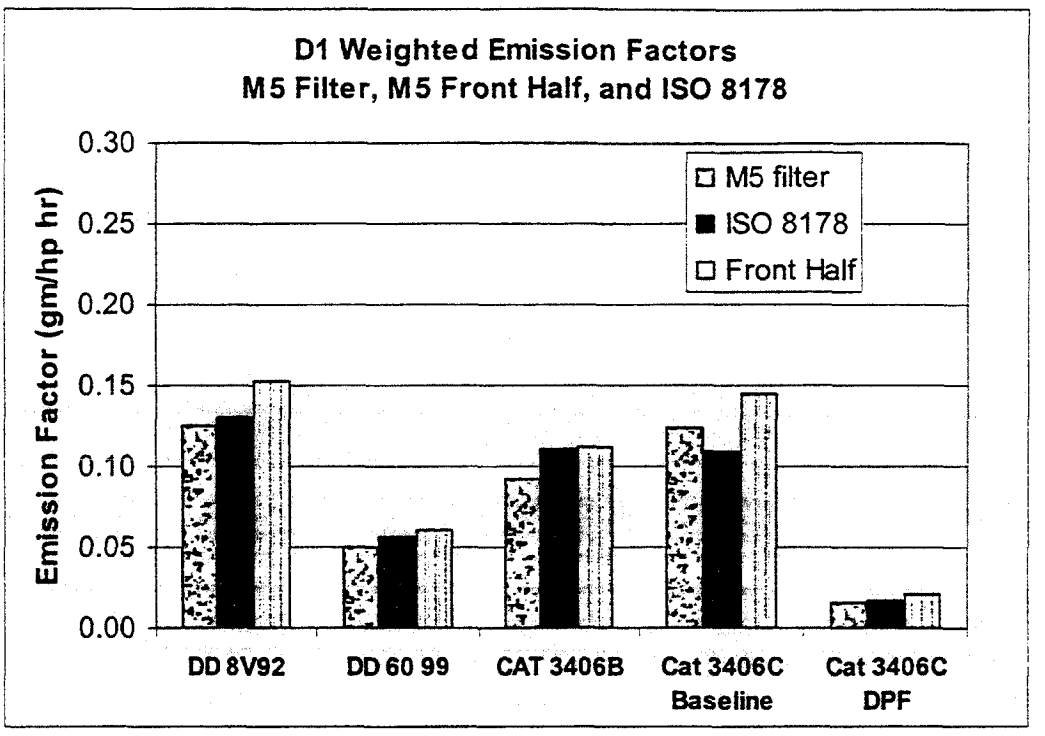
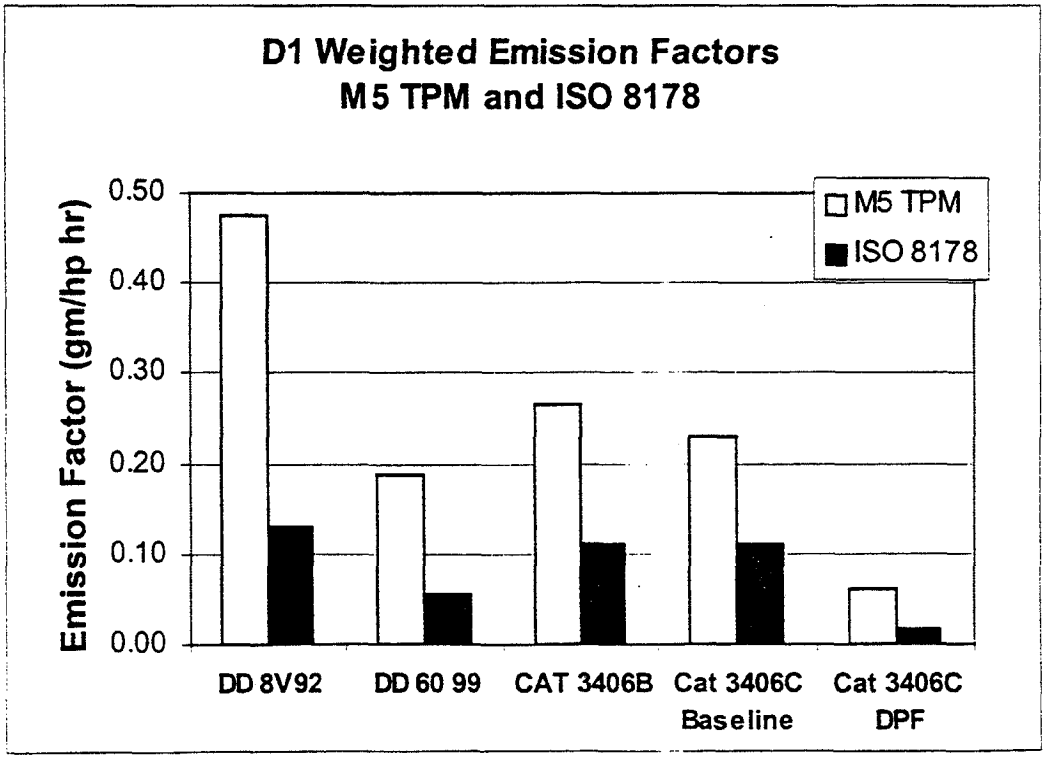


Figure G-2: D1 Weighted Emission Factors - M5 Total PM and ISO 8178 Filter



The test results indicate that total PM measured using ARB Method 5 are two to four time higher than total PM measured by ISO 8178. In comparing ARB Method 5 filter only, ARB Method 5 front half catch with ISO 8178 total PM, the results show good agreement. This data indicate that the differences in exhaust dilution and filter temperature conditions may not have as significant impact as inclusion of a condensable component, when measured gravametrically. The condensable portion can be as large as 75 percent of the total PM.

The control device efficiency, as listed in Table G-5, was calculated from the change in emission factors divided by the baseline emission factors for 1) the Method 5 filter only, 2) Method 5 front half, 3) Method 5 total PM, and 4) ISO 8178. Again, there was good agreement between the control efficiencies measured by Method 5 filter only, Method 5 front half and ISO 8178, all close to 85 percent. The 75 percent reduction calculated using ARB Method 5 total PM was lower. Since all the calculated control efficiencies were lower than a projected 90 percent, the unit was inspected by the manufacturer's technician. During the inspection, a leak was found in the seal between the ceramic filter and the housing. Upon completion of the comparison study, the leak was sealed and control efficiency increased to approximately 91 percent, based on further ISO 8178 testing.

In summary, comparisons of the D1 weighted emission factors for the two test methods indicate the following

- ARB Method 5 total PM is 2 to 4 times higher than ISO 8178 PM.
- ARB Method 5 filter only, ARB Method 5 front half and ISO 8178 levels showed good agreement.
- Measured control efficiency was lower using ARB Method 5 total PM
- Measured control efficiency was similar for ARB Method 5 filter only, ARB Method 5 front half and ISO 8178 methods.

IV. Discussion

While there are many differences in stationary source and off-road type testing, the inclusion of the condensable component may have the largest effect. While ARB Method 5 includes a condensable component, the off-road methods typically include only a filterable component. Proponents of the off-road methods argue that the stationary source methods which includes condensable PM such as ARB Method 5 overestimate the PM by including artifacts or secondary particulate formed from the interaction of particulate precursors including sulfur dioxide, sulfur trioxide, oxides of nitrogen and ammonia with water in the impinger. (England, 2000)

Proponents of stationary source methods such as ARB Method 5 argue that off-road methods underestimate condensable portion of the total PM by using sampling temperatures that are higher than ambient temperatures and by excluding secondary particulate formation that may occur in the condensable impinger portion of stationary source test methods. In addition, the off-road methods are based on dilution techniques

requiring equipment that is generally limited to test bed facilities. Since stationary source engines are not portable and require compliance methods that can be performed in the field, off-road methods have not been available for stationary source testing until very recently. With the development of mobile test labs and minidilution systems, off-road dilution based methods are becoming available for field-testing, but are not widely available at this time. Also, some of the commercial minidilution systems do not have integrated exhaust flow measurement capabilities and rely on the same types of flow measurements used in stationary source testing. Precise measurement of the exhaust flow rate is essential to accurately determine the mass emission rate of the pollutant as required by most regulations.

V. Recommendations

The emission levels and control efficiencies contained in the regulation are derived from off-road engine certification and verification programs. These programs are generally based on dilution methods that include specified test cycles. Based on the results of this method comparison, the limits contained in this regulation may not be able to be met using a compliance method that contains a condensable component. As determined in this study, ARB Method 5 total PM is two to four times higher than ISO 8178 emission factors. In addition, measured control device efficiency was lower when using ARB Method 5 total PM. Other studies evaluating the condensable component have shown that particulate levels in the condensable portion are dependent on fuel sulfur levels and sampling. (England, 2000) Since total PM levels are much lower in controlled engines, required sample times can increase significantly, potentially increasing the level of secondary particulate formation. While many of these devices do require low sulfur fuel, some manufacturers are developing selective catalysts to be used with higher fuel sulfur level, which may also increase the potential for sulfate formation in the backhalf component.

In order to harmonize with certification and verification programs, staff recommend ISO 8178 as the primary test method for to demonstrate compliance with the requirements of this regulation. Since there is good agreement between the emission factors calculated from ARB Method 5 front half portion and ISO 8178 emission factors, staff recommends allowing ARB Method 5 front half (filter + probe wash) to be used as an alternative. When using ARB Method 5 front half as an alternative to ISO 8178, staff recommend using steady–state emission test cycles as outlined in ISO 8178 Part 4.

We believe that using the front half component as a measure of diesel PM emissions is consistent with the methodologies that were used to estimate diesel PM exposure concentrations in the key epidemiological studies supporting the identification of diesel PM as a toxic air contaminant. In the railroad worker study, diesel exhaust exposure was estimated using personal samplers and fixed Hi-volume samplers. (OEHHA, 1998) The high exposure group included individuals working in the close proximity to locomotives. Given the close proximity of the exposed individuals to the source of diesel exhaust emissions, we believe that the PM measured was predominately "fresh" (i.e. minutes old) diesel exhaust emissions. That is, diesel exhaust which had not

undergone significant atmospheric transformation. Because the impinger catch passes the diesel exhaust through two water impingers, the PM captured in the impingers is more representative of "aged" (i.e. hours to days old) diesel exhaust. Thus, we believe that "fresh" diesel emissions are best estimated by using the front half component without counting the material collected in the impinger. Using the impinger catch may overestimate the diesel PM concentration compared to the concentrations found in the health studies. In the truck driver study, measurements of elemental carbon were used as a surrogate for diesel exhaust emissions. Elemental carbon is exclusively captured in the front half. Thus, using the front half catch without counting the material collected in the impinger is appropriate for measuring elemental carbon.

Since the key epidemiological studies focused on "fresh" diesel exhaust or elemental carbon, we believe that using the front half to estimate PM emission is consistent with the techniques used to establish diesel PM as a toxic air contaminant.

Figure G-3: MY 1991 CAT 3406B Baseline

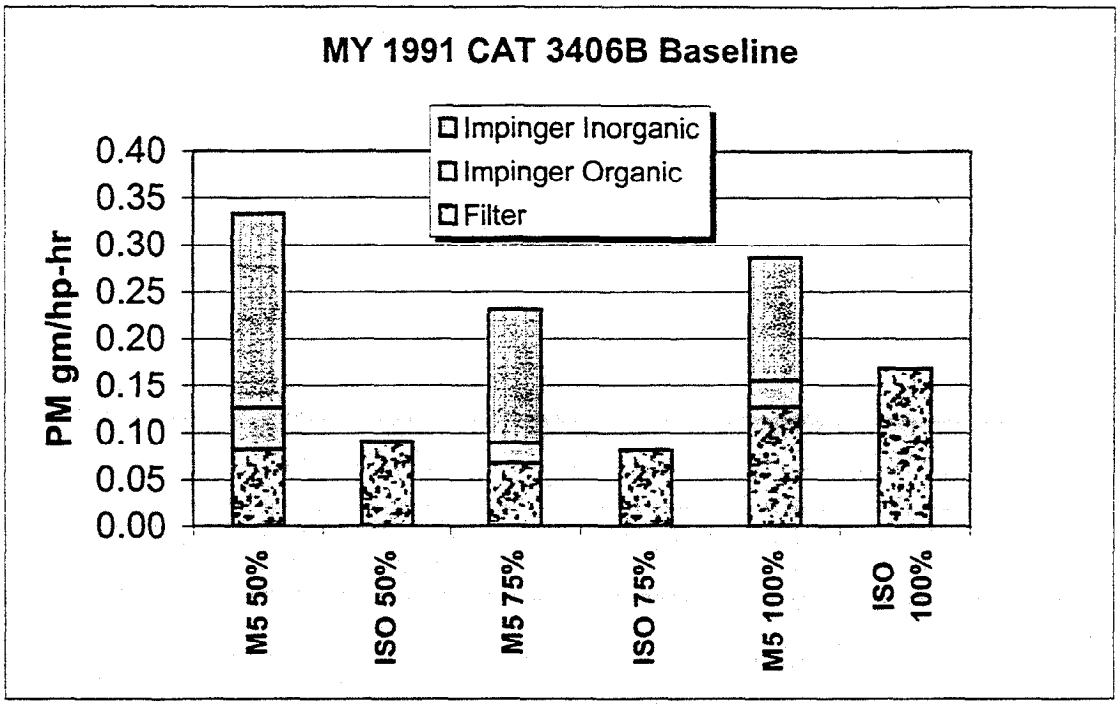


Figure G-4: MY 1991 DDC 8V 92 Baseline

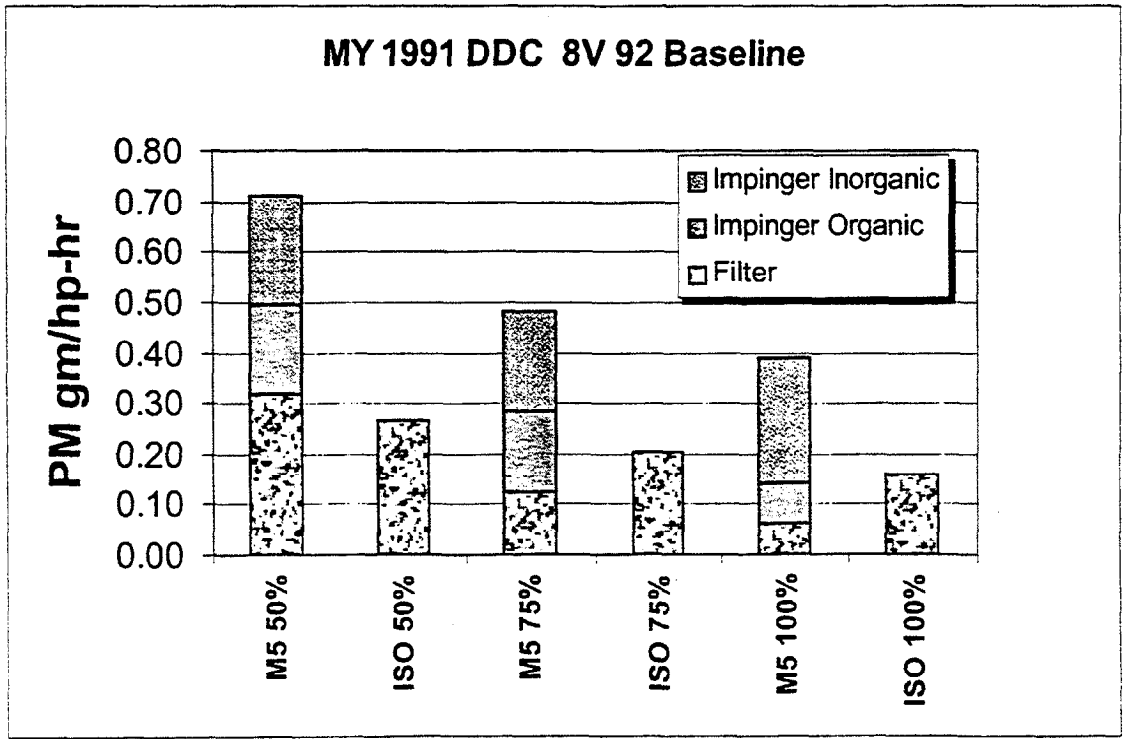


Figure G-5: MY 1999 DDC Series 60 Baseline

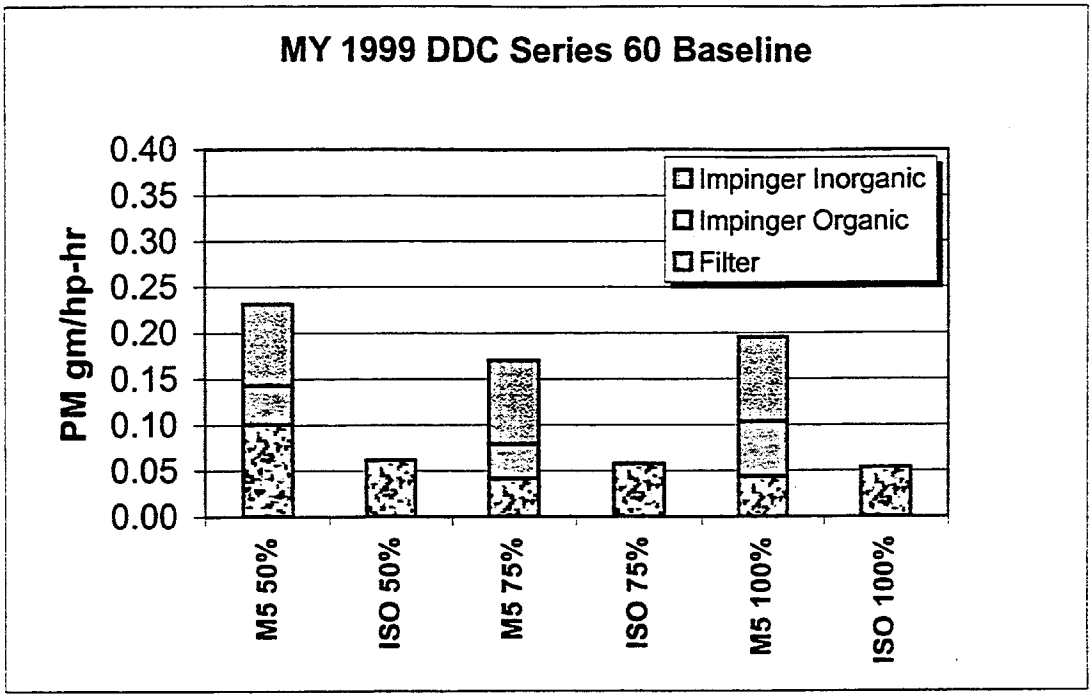


Figure G-6: MY 2000 CAT 3406C Baseline

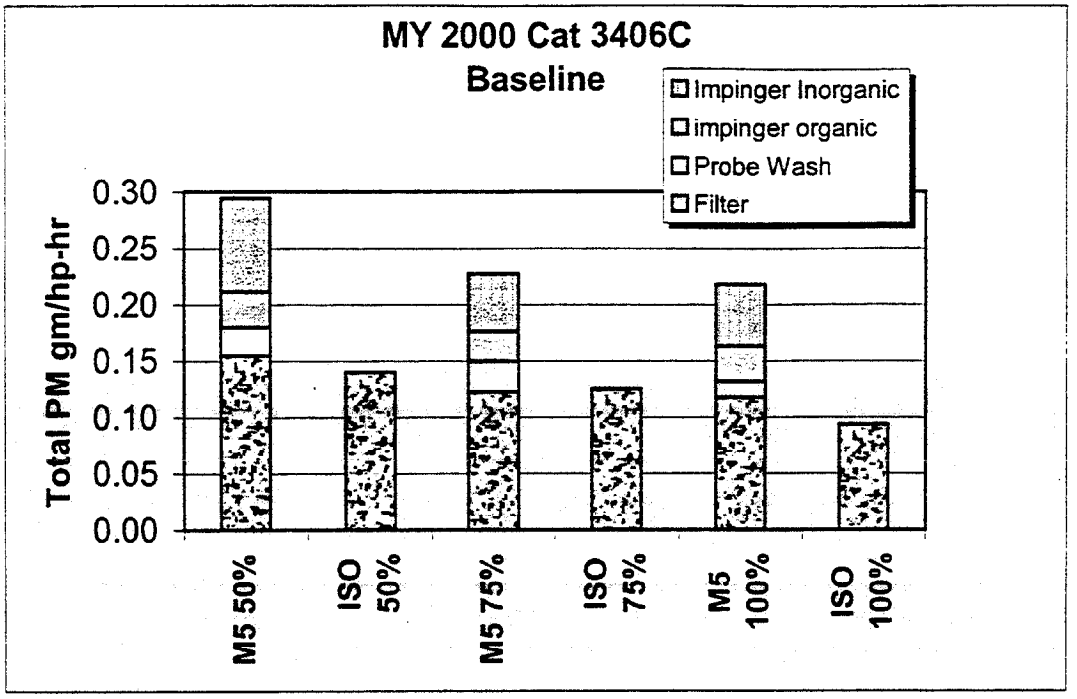
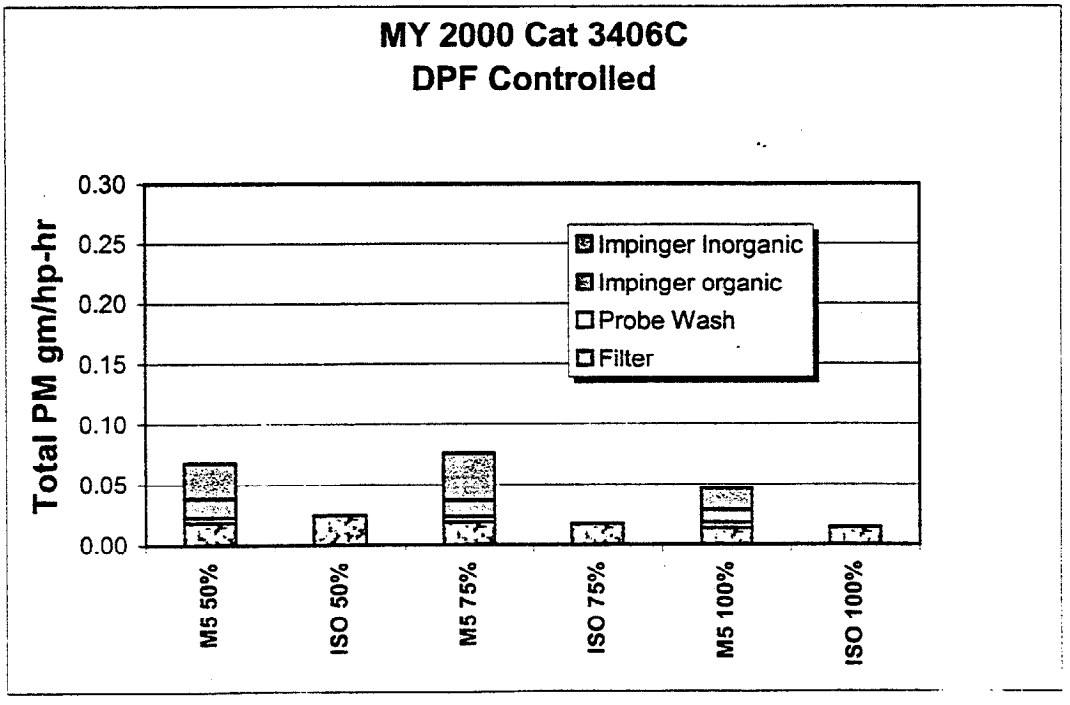


Figure G-7: MY 2000 CAT3406C DPF Controlled



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California Air Resources Board. *Method 100 Procedures for Continuous Gaseous Emission Stack Sampling*; Adopted June 29, 1983, Amended July 28, 1977. (ARB, 1983a)

California Air Resources Board. *Method 1 Sample and Velocity Traverses for Stationary Sources*; Adopted June 29, 1983, Amended March 28, 1986, July 1, 1999. (ARB, 1983b)

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California Air Resources Board. *Method 4 Determination of Moisture Content in Stack Gasses*; Adopted June 29, 1983, Amended July 1, 1999. (ARB, 1983e)

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England, Glenn C., et al. *Characterizing PM2.5 Emission Profiles for Stationary Sources: Comparison of Traditional and Dilution Sampling Techniques*, Fuel Processing Technology 65-66, 177-188, Elsevier Science; 2000. (England, 2000)

Office of Environmental Health Hazard Assessment. *Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant, Appendix III Part B Health Risk Assessment for Diesel Exhaust*, April 22, 1998. (OEHHA, 1998)

Appendix H

Diesel PM Control Technology Demonstration Program for Stationary Applications

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I. Background

There are a number of potentially effective emission control technologies for stationary applications available to reduce diesel particulate matter (PM). Diesel particulate filters (DPFs) and diesel oxidation catalysts (DOCs) have been effective for on-road applications and show potential for stationary engine applications, as well. To gather additional data on the technical feasibility of diesel PM control technologies and the applicability to stationary diesel-fueled engines, the Air Resources Board (ARB) funded a demonstration program. The purpose of the demonstration program was to:

- Demonstrate diesel PM control technologies on stationary engines.
- Identify applications and operating duty cycle conditions where specific particulate filter technologies may or may not be effective.

In this appendix, a brief background on the demonstration project is provided along with a description of the control technologies evaluated, the test results and the preliminary findings.

The stationary engine control device demonstration was performed in conjunction with a California Energy Commission Back-up Generator Program (CEC BUG). (CEC, 2001) The demonstration included testing of backup generators for baseline emission levels, retrofitting selected engines with commercially available PM control devices and testing controlled emission levels.

Emissions were tested for PM, total hydrocarbons (THC), methane, nonmethane hydrocarbons (NMHC), CO_2, CO, NOx, NO_2 per International Organization for Standardization Reciprocating Internal Combustion Engines-Exhaust Emission Measurement (ISO 8178) Parts 1, 2, and 4. (ISO/DP 8178, 1992) A five-mode D2 test cycle was used in all emission testing. The program was designed to support the testing and data requirements for control device verification under ARB's Verification Procedure, Warranty and In-Use Compliance Requirements of In-Use Strategies to Control Emissions from Diesel Engines (Verification Procedure). (ARB, 2002) To support verification, the test protocol included baseline testing and initial control efficiency, durability and post-durability control efficiency. Durability and post-durability testing was only performed for the devices that initially met the projected control efficiency for the targeted tier level (25 percent, 50 percent, or 85 percent). For the devices that did not meet the initial projected control efficiency, conditional durability and post-durability testing were not performed.

Emission testing was performed by University of California, Riverside, Bourns College of Engineering-Center for Environmental Research and Testing (UCR CE-CERT) under the direction of Wayne Miller, Ph.D.

II. Control Technologies

Diesel PM control technologies were selected based on a number of criteria: projected PM control efficiencies, commercial availability, demonstrated infield use, willingness of manufacturer to complete the verification process and product cost. Because the Verification Procedure is based on tiered emission levels, devices were selected that were projected to meet 25 percent, 50 percent, and 85 percent PM control. Technologies included emulsified diesel fuel, diesel oxidation catalysts, flow through filter technology and both active and passive particulate filters. When recommended by the control technology manufacturers, fuel-borne catalysts were used to enhance or promote regeneration. The control device technologies that were tested are described in Table H-1.

Table H-1: Control Strategies Included in Demonstration Program

Control Device Manufacturer	Product	Product Description
Lubrizol-Engine Control Systems	Sequentially Regenerated Combifilter	Triple bank silicon carbide particulate filter with online filter regeneration by electrical heating (Active DPF).
Johnson Matthey	Continuously Regenerating Trap (CRT)	Catalyzed diesel particulate filter (Passive DPF).
Sud Chemie	SC-DOC	Diesel Oxidation Catalyst (DOC 1).
CleanAir Systems Flow-Thru-Filter System and Clean Diesel Technologies (CDT) Fuel-Borne Catalyst	Flow-Thru-Filter System combined with CDT Fuel-Borne Catalyst	Combined system includes a DOC, flow through filter used with a CDT fuel-borne catalyst. The flow through filter component was removed prior to testing due to lower than required exhaust temperatures (DOC with Fuel-Borne Catalyst or DOC/FA).
Chevron	Proformix Fuel	Water emulsified fuel (20% water emulsification) utilizes Lubrizol's PuriNOx™ technology (Emulsified Fuel).
Catalytic Exhaust Products Particulate Filter and Clean Diesel Technologies Fuel-Borne Catalyst	SXS-B/FA combined with CDT Fuel-Borne Catalyst	Uncatalyzed diesel particulate filter used with a CDT fuel-borne catalyst (Particulate Filter with Fuel-Borne Catalyst or DPF/FBC).

All baseline engine tests were performed using currently available on-road diesel fuel that meets the specifications defined in Title 13, CCR sections 2281-2281 (CARB Diesel). (CCR Title 13, Sections 2281, 2282) Control device retrofit testing was performed using either CARB diesel or low sulfur diesel fuel (<15 ppm sulfur), as

recommended by the control device manufacturer. Water emulsified diesel, developed to reduce both NOx and PM, was also included in the study as a control strategy for evaluation.

III. Emission Testing

Emissions testing was performed for particulate matter, CO_2, CO, NOx, NO_2, total hydrocarbons (THC) and non-methane hydrocarbons (NMHC) following the methods specified in ISO 8178. Exhaust analysis of the gaseous components was performed using the continuous measurement methods listed in Table H-2.

Table H-2: ISO 8178 Recommended Continuous Gaseous Sampling Analyzers

Gaseous Pollutant	Ambient Level Sampling Per ISO 8178
NOx and NO_2 (See Note 1)	Chemiluminescence
CO	Non-dispersive infrared (NDIR)
CO2	Non-dispersive infrared (NDIR)
Total Hydrocarbons	Flame ionization detector (FID)
CH4 and Non methane Hydrocarbons (NMHC)	GC combined with FID to measure CH4. NMHC from difference between THC and CH4

Note 1: Speciated NO_2 is not included in this test method. It was included in this study as required by CARB verification procedures.

Emission testing was performed using full-flow constant volume sampling (CVS) per ISO 8178. In the CVS method, the engine exhaust is diluted with air to maintain a constant total flow rate (air + exhaust) under all running conditions. Total exhaust (full-flow) is collected and mixed with air in the full-flow primary dilution tunnel. Particulate matter sampling is done from diluted exhaust gas. This is achieved by turbulent mixing of exhaust gases with air in a dilution tunnel. A sample for particulate measurement is drawn from that tunnel into a small secondary dilution tunnel, further mixed with air and collected on particulate filters maintained 52 °C, maximum. Samples for continuous gas phase measurements are drawn from the primary dilution tunnel. The volumetric flow rate of the dilution air and diluted exhaust gas are measured along with temperatures and pressures, allowing computation of the total mass flow rate of exhaust and mass emission rates of the sampled components.

Eleven engines were tested for baseline emission levels. Seven diesel PM control systems were selected for testing on generators. Testing of the generators fitted with diesel PM control systems included five components:

- Baseline engine testing
- Control device retrofitting and retrofit degreening for 25 hours

- Control device emission testing to establish initial control efficiency
- Durability operation for conditional durability period (168 hours)
- Post-conditional durability emission testing.

During testing, degreening and durability operation, backpressure and exhaust temperature were monitored to establish exhaust temperature profiles, determine conformance to backpressure limits of the engine and ensure that the device was regenerating properly. Testing was performed in triplicate unless additional tests were required to quantify emission levels during distinct regeneration phases.

Durability cycling was performed for the control devices that successfully met the projected control efficiencies during the initial control device testing. The durability cycle included 24 cold starts followed by 24 hours of operation at 30 percent load, 24 hours at 50 percent load and 24 hours at 85 percent load. The cold starts were approximately ½ hour, under no load, with a 12-hour cooling period between starts. This durability cycle was repeated twice to reach the 167 hours required for conditional verification for stationary backup generators. The durability cycle was developed to model typical backup generator cold start maintenance cycling and emergency operation at three different projected operational loads. Since this program was designed to support the requirements of verification, testing was stopped if the device did not meet the projected level of control efficiency, the control device malfunctioned or clogged, or the engine backpressure limits were exceeded.

On successful completion of durability, the retrofitted engines will be emission tested to establish post-conditional durability control levels. The durability and post-durability test phases of the program are currently in progress and are expected to be complete in the late 2003 timeframe.

Test Cycles: Mass emission rates were measured at steady-state conditions for specified speeds and loads developed for off-road engine applications as listed in ISO 8178 Part 4. The specified test load was provided by using a generator load cell connected to the test engines. A test cycle includes a set of modes with a specified torque, speed and weighting value designed for specific engine uses. For a given test cycle, a weighted emission factor was calculated using weighted modal emission mass rates and divided by a weighted load value. Three of the common test modes are listed in Table H-3. EPA off-road engine certification is typically based on a C1 test cycle or a D2 test cycle, under special test procedures. Due to different modal loads, speeds and weighting values included in each test cycle, emission factors derived from different test cycles are not directly comparable. Since diesel generators only operate at rated speeds, field-testing could not be performed with a C1 cycle since it includes rated and intermediate speed modes. For generators, both D1 and D2 modes are acceptable. For this testing, the 5-mode D2 test cycle was selected since it is better representative of backup engines that have low load intermittent maintenance operation and higher load functional operation. In addition, a D1 emission factor can also be calculated using modes 1, 2, and 3 and D1 weighting factors.

Table H-3: Weighting Factors for C1, D1 and D2 Type ISO 8178 Test Cycles

Mode number	1	2	3	4	5	6	7	8	9	10	11
Torque, %	100	75	50	25	10	100	75	50	25	10	0
Speed	Rated speed					Intermediate speed					Low idle
Type C1	0.15	0.15	0.15	-	0.10	0.10	0.10	0.10	-	-	0.15
Constant speed											
Type D1	0.30	0.50	0.20	-	-	-	-	-	-	-	-
Type D2	0.05	0.25	0.30	0.30	0.10	-	-	-	-	-	-

Test Engines: Test engines were selected based on an analysis of the engine database compiled in CEC's BUG Program (CE-CERT, 2001). The database was developed by cataloging permitted backup generators in California that were greater than 300 kW. A test engine matrix was developed by determining predominant categories of engine manufactures, engine sizes and model years. Based on the analysis and as shown in Table H-4, engines from three manufactures were included in the study: Caterpillar, Cummins and Detroit Diesel. Two engine size categories were selected: 500 to 700 kW and 1500 to 2000 kW. Three model year groupings were selected: pre-1987, 1987-1996, and post-1996. A total of 11 engines were tested for baseline emissions, with one additional planned, in the 500 to 700 kW range. Two engine tests are still planned for the 1500 to 2000 kW range. Once the test engine categories were defined, the specific engine model and model year were selected based on engine availability and control device manufacturer's recommendations. Selection of the appropriate engine was typically based on engine design and operating parameters such as exhaust temperature and emission levels and targeted market for the retrofit device. When stationary engines were not available, equivalent portable generators were used for testing and retrofit.

Table H-4: Stationary Engine Control Demonstration Program Test Engine Matrix

Engine	Program ID	Model Year	Control
Detroit Diesel V92	Bug 2	1991	
CAT 3406B	Bug 3	1991	
Cummins KTA19G2	Bug 4	1990	
Cummins N14	Bug 5	1999	
Detroit Diesel Series 60	Bug 6	1999	
CAT 3412C	Bug 7	Post 96	
CAT 3408B	Bug 8	1990	Baseline (Planned)
CAT 3406C	Bug 12	2000	Passive DPF
CAT 3406C	Bug 10	2000	Active DPF
Detroit Diesel V92	Bug 14	1985	DOC/FBC
CAT 3406C	Bug 10	2000	DOC 1
Detroit Diesel V92	Bug 14	1985	DOC 1
CAT 3406C	Bug 9	Post 96	Emulsified Fuel
CAT 3406B	Bug 11	1986	Emulsified Fuel
CAT 3406C	Bug 10	2000	DPF/FBC (Planned)

Table H-5: Average D2 Weighted Emissions Factors for Baseline Engine Testing

				D2 Weighted Emission Factors (g/bhp-hr)						
Engine Make and Model	**Model Year**	**Fuel**	**Load (hp)**	**THC**	**CH4**	**NMHC**	**CO**	**NOx**	**CO_2**	**PM**
DDC V92 Bug 14	1985	CARB Diesel	389.62	0.66	0.05	0.61	1.72	10.79	713.74	0.20
DDC V92 Bug 2	1991	CARB Diesel	469.00	0.47	0.04	0.44	0.94	7.82	647.98	0.23
DDC Series 60 Bug 6	1999	CARB Diesel	400.66	0.07	0.01	0.06	0.55	7.45	551.29	0.06
CAT 3406B Bug 11	1986	CARB Diesel	399.32	0.15	0.03	0.12	0.68	11.32	572.27	0.09
CAT 3406B Bug 3	1991	CARB Diesel	402.00	0.12	0.03	0.10	0.95	10.22	613.57	0.11
CAT 3412C Bug 7	Post-96	CARB Diesel	730.30	0.10	0.03	0.07	1.12	7.67	606.93	0.16
CAT 3406C Bug 9	Post-96	CARB Diesel	469.00	0.16	0.03	0.27	1.23	6.51	546.22	0.15
CAT 3406C Bug 10	2000	CARB Diesel	464.98	0.08	0.02	0.07	1.47	6.78	564.02	0.16
CAT 3406C Bug 12	2000	CARB Diesel	465.86	0.09	0.02	0.07	1.04	6.61	557.20	0.14
CUM KTA 19G2 90 Bug 4	1990	CARB Diesel	477.04	0.39	0.04	0.35	0.69	7.03	546.4	0.22
CUM N14 99 Bug 5	1999	CARB Diesel	470.34	0.22	0.02	0.20	0.46	6.03	586.53	0.06

Figure H-1: Average D2 Weighted PM Emission Factors for Baseline Engine Testing

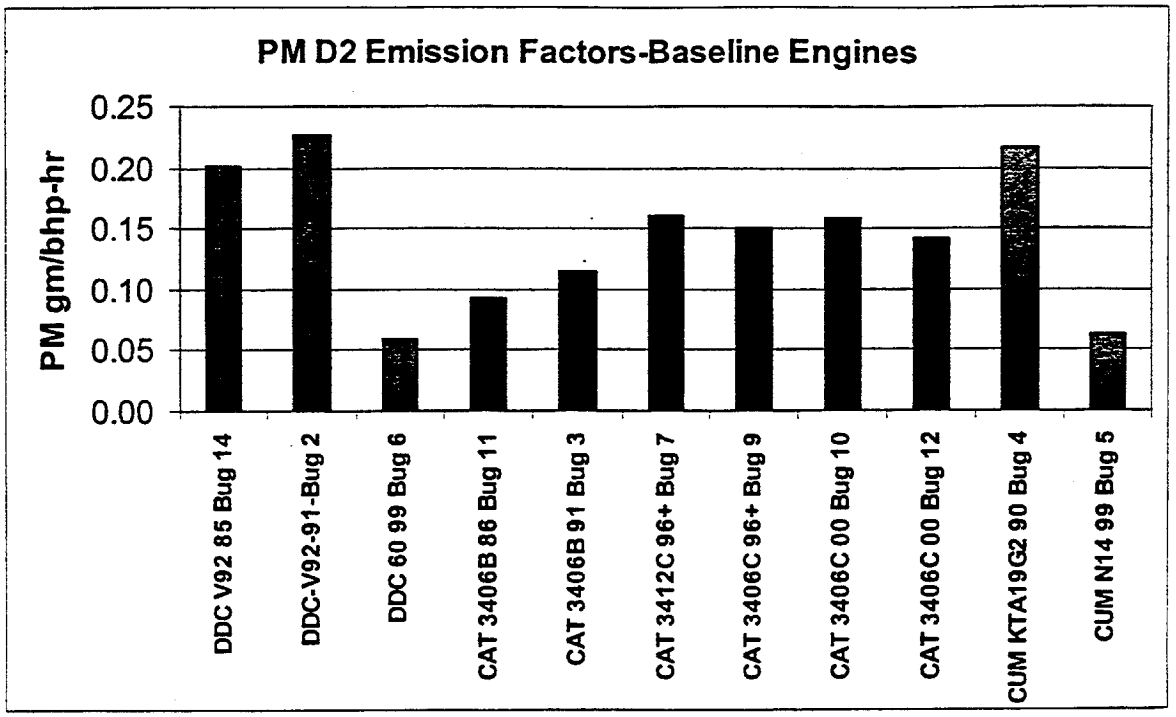
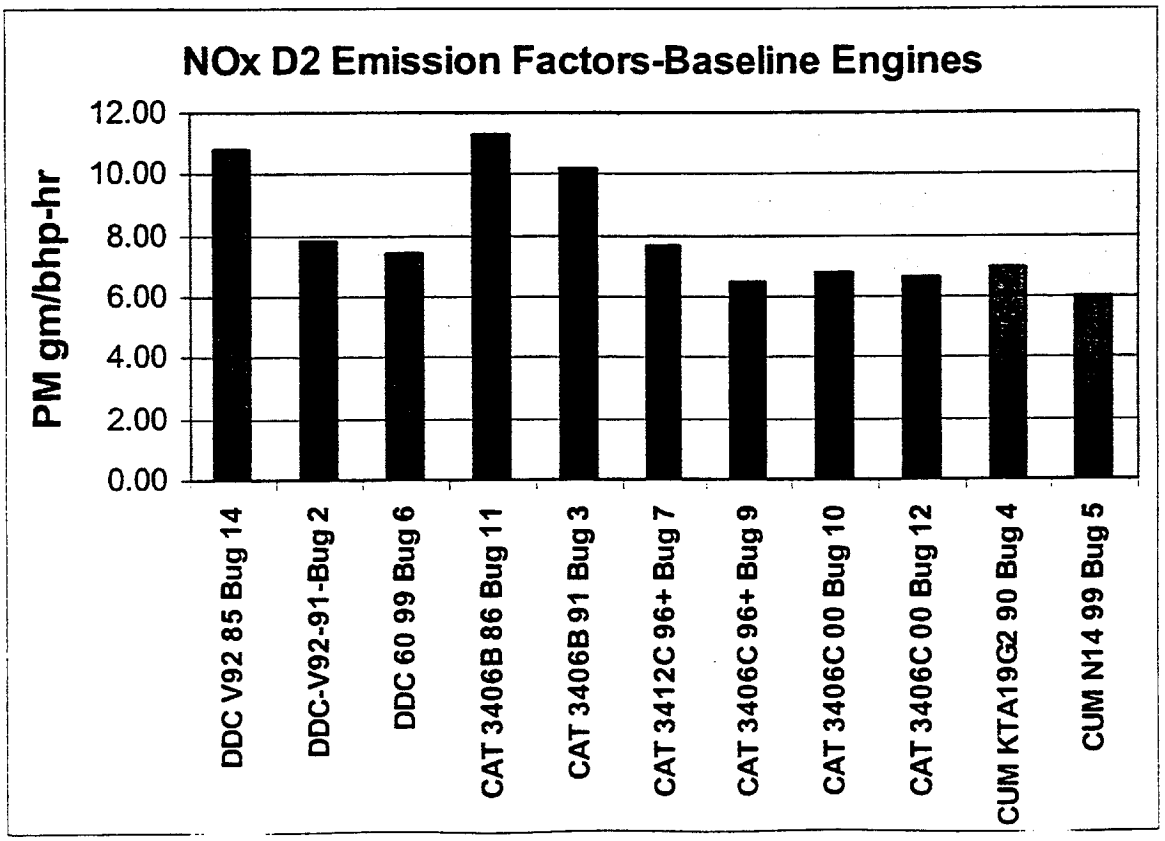


Figure H-2: Average D2 Weighted NOx Emission Factors for Baseline Engine Testing



Control Device Testing: To measure the initial control efficiency, retrofit engine emissions testing was performed after a 25 hour degreening process for PM and gaseous emissions per ISO 8178. For each of the control devices, average D2 weighted emission factors were measured and control efficiencies were calculated as listed in Table H-6. Following Table H-6, are detailed discussions on each device including a description of the technology and the results of the demonstration study.

Table H-6: D2 weighted Emission Factors and Control Efficiencies

		Average D2 Weighted Emission Factors (gm/bhp-hr)						
Configuration	**Fuel**	**100% Load (HP)**	**THC**	**CH_4**	**NMHC**	**CO**	**NOx**	**PM**
2000 CAT 3406C with Johnson Matthey CRT Passive DPF								
Baseline	CARB Diesel	465.9	0.087	0.015	0.074	1.041	6.608	0.142
Controlled	ULSD	467.1	0.007	0.003	0.004	0.228	6.212	0.012
Percent Reductions			92.3	82.6	94.1	78.1	6.0	91.4
2000 CAT 3406C with ECS Sequentially Regenerated Combifilter Active DPF								
Baseline	CARB Diesel	465.0	0.082	0.017	0.067	1.468	6.783	0.159
Controlled	ULSD	458.8	0.050	0.015	0.037	1.645	6.042	0.0003
Percent Reductions			39.5	16.1	44.7	-12.1	10.9	99.8
1985 2 stroke Detroit Diesel V92 with CleanAir Systems DOC and CDT Fuel-Borne Catalyst								
Baseline	CARB Diesel	389.6	0.659	0.053	0.613	1.715	10.785	0.201
Controlled	ULSD+FBC	389.6	0.200	0.014	0.188	0.100	11.545	0.121
Percent Reductions			69.6	73.0	69.3	94.1	-7.0	40.0
2000 CAT 3406C with Sud Chemie DOC								
Baseline	CARB Diesel	465.0	0.082	0.017	0.067	1.468	6.783	0.159
Controlled	CARB Diesel	467.7	0.011	0.002	0.009	0.058	7.168	0.129
Percent Reductions			86.7	90.3	85.9	96.0	-5.7	18.8
1985 2 stroke Detroit Diesel V92 with Sud Chemie DOC								
Baseline	CARB Diesel	389.6	0.659	0.053	0.613	1.715	10.785	0.201
Controlled	CARB Diesel	393.5	0.307	0.022	0.288	0.206	10.860	0.107
Percent Reductions			53.4	58.2	53.1	88.0	-0.7	46.9
1986 CAT 3406B with Emulsified Diesel								
Baseline	CARB Diesel	399.3	0.147	0.027	0.124	0.679	11.321	0.093
Controlled	Emulsified Fuel	363.1	0.161	0.026	0.139	0.496	10.914	0.076
Percent Reductions			-9.7	2.4	-12.0	27.0	3.6	17.8
Post- 96 CAT 3406C with Emulsified Diesel								
Baseline	CARB Diesel	469.0	0.163	0.031	0.270	1.234	6.512	0.150
Controlled	Emulsified Fuel	469.0	0.131	0.027	0.108	0.820	5.563	0.041
Percent Reductions			19.4	13.1	60.0	33.6	14.6	72.7

Active DPF

The Lubrizol-Engine Control Systems (ECS) electrically regenerated Combifilter was retrofitted on a model year (MY) 2000 Caterpillar 3406C generator. This control system includes three silicon carbide diesel particulate filters with an electrical regeneration system designed to provide continuous PM control. The triple filter system provides uninterrupted emission filtration during regeneration by switching the exhaust flow between filters. The regeneration system was electronically controlled and entirely automatic. The main components of the system are the ceramic wall-flow filter elements, electronic control unit (ECU), electrical heater system, compressed air blower system and valve system to switch the exhaust flow between filters. The system provides online regeneration by isolating one filter at a time from the exhaust stream to allow for electrical regeneration of that filter. The filter is regenerated by electrical heating combined with a low flow of compressed air. Upon completion of the regeneration cycle, the filter is brought back online for operation. The system operates in two modes: a soot cycle where all three filters are open to exhaust and a regeneration mode where one filter is isolated for regeneration. These two cycles continue throughout operation, sequentially regenerating one filter during each regeneration cycle. This design provides continuous filtration, with regeneration automated by the timed control system.

Because the system operates in two distinct modes, soot and regeneration, 5-mode emission testing was performed in triplicate for both modes. The average emission factors, listed in Table H-6, were calculated using modal data from all soot and regeneration modes. The emission test results show a greater than 99 percent reduction in PM. In addition, NMHC were reduced by approximately 45 percent and NOx by 10 percent. While the particulate matter reduction was very high, this system had two areas of concern. First, backpressure levels measured during durability were higher than anticipated. During the durability cycling, average backpressure was measured at approximately 50 inches H_2O at 65 and 85 percent loads, with a maximum of approximately 70 inches H_2O. This unit was originally designed for a smaller two-stroke Detroit Diesel engine. The manufacturer attributes the higher than anticipated backpressure to differences in engine exhaust flows and exhaust hardware between the Detroit Diesel and the Caterpillar 3406C engine. The manufacturer indicated that this was a sizing issue that would be addressed during the design phase of stationary source retrofitting.

The second issue concerned the regeneration control system. The regeneration control system initially had functional problems, which were corrected. Additionally, CE-CERT testing staff found that during the intermittent cold start portion of durability cycling, the soot mode (all three filters open) was longer than had been indicated by the manufacturer. The result may be that the filters are not regenerating as often as described during cold start operation. We believe this may be a due to interruption of the control cycle during intermittent use. This may be an additional source of system backpressure. Since the regeneration system is controlled strictly by timing and not by backpressure sensors, this control scheme may need optimization for applications with

multiple cold starts. The manufacturer has indicated that both backpressure and regeneration cycling can be addressed and corrected within the control system design.

Passive DPF

The Johnson Matthey Continuously Regenerating Trap (CRT) was retrofitted on a MY2000 Caterpillar 3406C diesel generator. This is a passive, self-regenerating catalyzed diesel particulate filter. The CRT particulate filter is a patented emission control technology that contains a platinum-coated catalyst and a ceramic monolith particulate filter designed to control particulate matter (PM), carbon monoxide (CO) and hydrocarbon (HC) emissions through catalytic oxidation and filtration. The CRT is a trade name for a two-stage catalytic, passive filter configuration. The CRT system utilizes a ceramic wall-flow filter to trap particulates. The trapped particulate matter is continuously oxidized by nitrogen dioxide generated in an oxidation catalyst, which is placed upstream of the filter. The catalyst promotes the conversion of the NO in the exhaust to NO_2 in the first stage of the trap. The reverse process occurs in the subsequent particulate trap. The liberated oxygen atom burns the carbon in the particulate trap resulting in continuous regeneration at lower exhaust temperatures than are required for an uncatalyzed filter. The CRT requires low sulfur fuel.

The formation of NO_2 may problematic, since NO_2 levels for verified control devices are limited to 20 percent of the total engine baseline NOx emissions, as of January 1, 2003. Initial emission testing of the JM CRT resulted in control efficiencies just below 85 percent. A leak in the seal around the ceramic monolithic filter and housing was located and repaired and durability cycling began. Durability cycling was stopped after it was decided to retest the control efficiencies. After repairing the seal and retesting, the control efficiency was measure at 91 percent for PM and 94 percent for NMHC. The results of the retest are listed in Table H-6. In addition, hydrocarbons and carbon monoxides are also reduced significantly. NOx is reduced slightly, but the fraction of NO_2 increased. The controlled level of NO_2 is 25 percent of the total baseline NOx level, higher than the verification limit of 20 percent.

Diesel Oxidation Catalyst

The Sud-Chemie diesel oxidation catalyst (DOC 1) was retrofitted on a MY2000 Caterpillar 3406C and a MY1985 2 stroke Detroit Diesel V92. The SC-DOC contains a proprietary catalyst designed promote chemical oxidation of CO and HC as well as the SOF portion of diesel particulate while mitigating the oxidation of fuel sulfur to form sulfate particulate. Because of the selective catalyst formation, low sulfur diesel fuel is not required. Initial control device testing on the Caterpillar 3406C resulted in PM reductions of 18 percent, lower than originally anticipated. To investigate, Thermal/Optical Reflectance tests were performed on PM samples captured on parallel quartz filters to quantify the ratio of elemental carbon to organic carbon (EC/OC). The data indicated that the PM had a high ratio of EC/OC. Since diesel oxidation catalysts reduce the soluble organic fraction of the PM, the high ratio of elemental carbon may explain why the DOC efficiency was lower than originally expected. The DOC was also

retrofitted on a MY1985 two stroke Detroit Diesel V92 and emission tested. The measured control efficiency was better than 46 percent for PM and 53 percent for NMHC. EC/OC ratios were lower, indicating a higher component of organic carbon species in the PM. Because of the additional testing, durability and post- durability emission testing was not performed for this control.

Diesel Oxidation Catalyst with Fuel-Borne Catalyst

The CleanAIR Flow Through Filter System was retrofitted on a MY1985 2-stroke Detroit Diesel V92. This system was projected to reduce PM by 50 percent without increasing NO_2 emissions. This system is a passive, flow-through-filter (FTF) combined with a Clean Diesel Technology (CDT) fuel borne catalyst to reduce diesel particulate emissions. A diesel oxidation catalyst (DOC), also part of the system, reduces CO and HC emissions. This system experienced regeneration problems during degreening operation (no load operation for 25 hours). The exhaust temperatures were not sufficient for regeneration and the flow-through-filter clogged. The flow-through-filter was removed and the DOC, combined with the fuel-borne catalyst was tested. The control efficiency of the DOC and FBC system was 40 percent for PM and 69 percent for NMHC, while NOx increased by approximately 7 percent. The conditional durability cycling of 168 hours for the DOC/FBC system is almost completed, indicating no durability problems, to date. Post- conditional-durability controlled emissions will be performed upon completion of durability.

Emulsified Fuel

Emulsified fuel testing was performed on two engines, a MY1986 Cat 3406B and a post- 96 CAT 3406C. Chevron Proformix fuel is a water emulsified diesel fuel that consists of a blend of water, conventional diesel fuel and an additive package, utilizing Lubrizol's PuriNOx technology. Small amounts of the additive package are added to the fuel to maintain the emulsion, enhance cetane and lubricity, inhibit corrosion, protect against freezing and prevent foaming. The water is suspended in droplets within the fuel lowering PM emissions by creating a leaner fuel environment in the engine. Also, the emulsified fuel creates cooling effect in the combustion chamber, thereby, decreasing NOx emissions. The formulation contains 77 percent diesel fuel, 20 percent water, and 3 percent additive package. Emissions testing of the CAT 3406B with emulsified fuel demonstrated PM reductions of 17 percent and NOx reductions of 3 percent. For the CAT 3406C, PM was reduced by 72 percent and NOx was reduced by approximately 14 percent. These varied results indicate that reductions may be dependent on engine design and combustion conditions and require further study.

Particulate Filter with Fuel-Borne Catalyst

The Catalytic Exhaust Products SXS-B/FA diesel particulate filter is an uncatalyzed ceramic wall flow filter combined with Clean Diesel Technology fuel-borne catalyst. It is planned for installation on a MY2000 Caterpillar 3406C diesel generator. This system combines a ceramic monolith trap with a Clean Diesel Technology fuel-borne catalyst to

facilitate regeneration of diesel particulate filter. The bare wall flow diesel particulate filter requires a minimum exhaust gas temperature of approximately 550 to 600 °C for 20 percent of operation in order for the particulate filter to regenerate properly. Addition of fuel borne catalysts assist in regeneration and allow the diesel particulate filter to regenerate at exhaust temperatures in the range of 320 to 350+ °C. Installation and emission testing for this system has not been completed, but is planned for late 2003.

IV. Discussion

Diesel Particulate Filters: Both active and passive diesel particulate filters were tested for backup generator applications. Control efficiency for both technologies were better than 90 percent. The technologies were capable of regenerating under the intermittent cold start maintenance cycling and loaded operation, typical for backup generators. While the passive CRT DPF did have increased levels of NO_2, overall NOx levels decreased by approximately 6 percent. The actively regenerating system showed better than 99 percent reduction for PM, with regeneration independent of exhaust temperature by design. Issues involving high backpressure levels and active regeneration control design need to be addressed during system design for stationary sources. The results from the demonstration testing indicate that both active and passive technologies are effective in reducing PM better than 85 percent. Durability testing for intermittent cold start and extended high load operation indicates that these technologies may be effective for other steady-state stationary engine applications, as well. The technologies are currently commercially available for retrofit applications.

Diesel Oxidation Catalysts: The effectiveness of diesel oxidation catalysts reportedly depends on the level of soluble organic fraction in the PM. Comparison testing on two engines showed that for low ratios of organic PM components, PM control effectiveness was lower than anticipated. (CE-CERT, 2003) Where the ratio of organic components was higher, the control efficiency increased significantly. Testing of two commercially available DOC technologies on a two stroke Detroit Diesel V92 showed control efficiencies in the range of 40 to 46 percent for PM and 53 to 69 for NMHC. NOx levels increased 1 to 7 percent. The NOx increases may be due to differences in ambient conditions during testing and are well below the limits included in the Verification Procedure. Demonstration testing indicates that DOC technologies are effective in providing better than 30 percent control efficiency for appropriate engine types.

Emulsified Fuel: Testing of emulsified fuels for two different Caterpillar engines resulted in a wide range of control efficiency for PM from 17 to 72 percent. Control efficiencies for NMHC were even more varied, ranging from a decrease of 60 percent to an increase in 12 percent. For both tests, NOx reductions ranged from 3 to 14 percent. These wide variations in test results indicate that further testing is required. Results also show that for certain engine types, emulsified fuel could be a very effective technology to reduce PM significantly, while also providing reductions in NOx.

Figure H-3. Average D2 Weighted PM Emission Factors for Baseline and Controlled Engine Testing

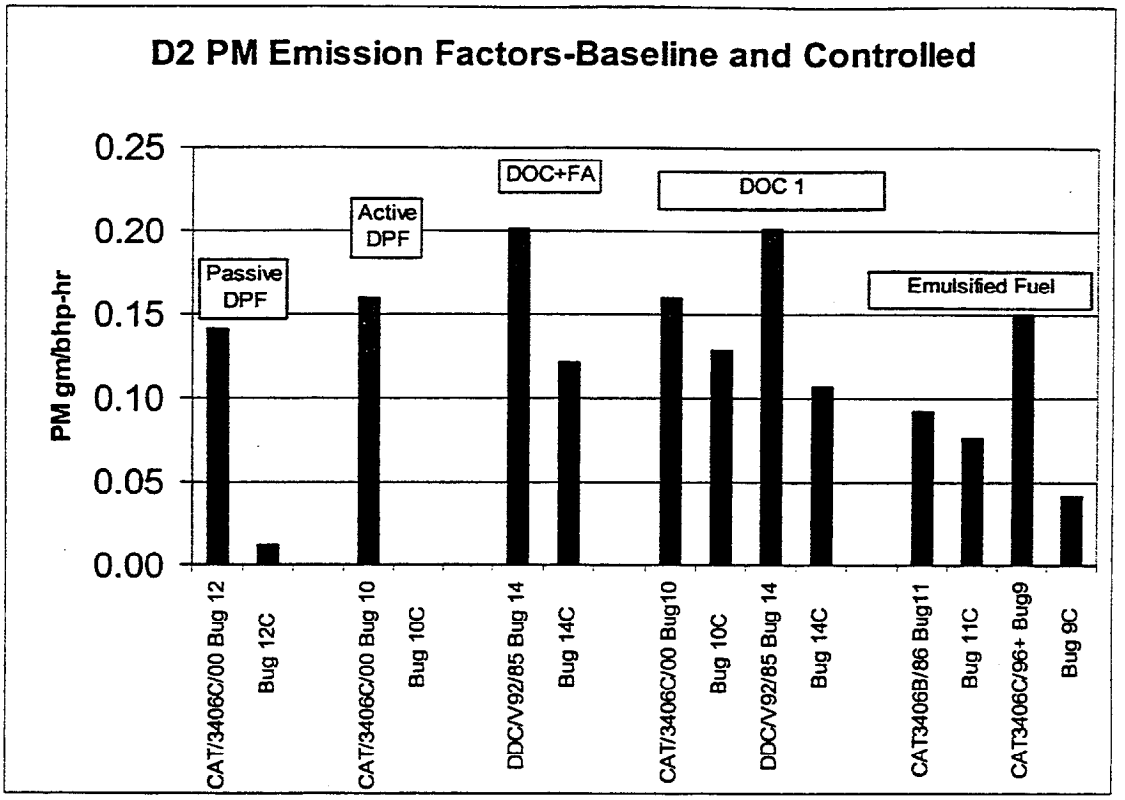


Figure H-4: Average D2 Weighted NOx Emission Factors for Baseline and Controlled Engine Testing

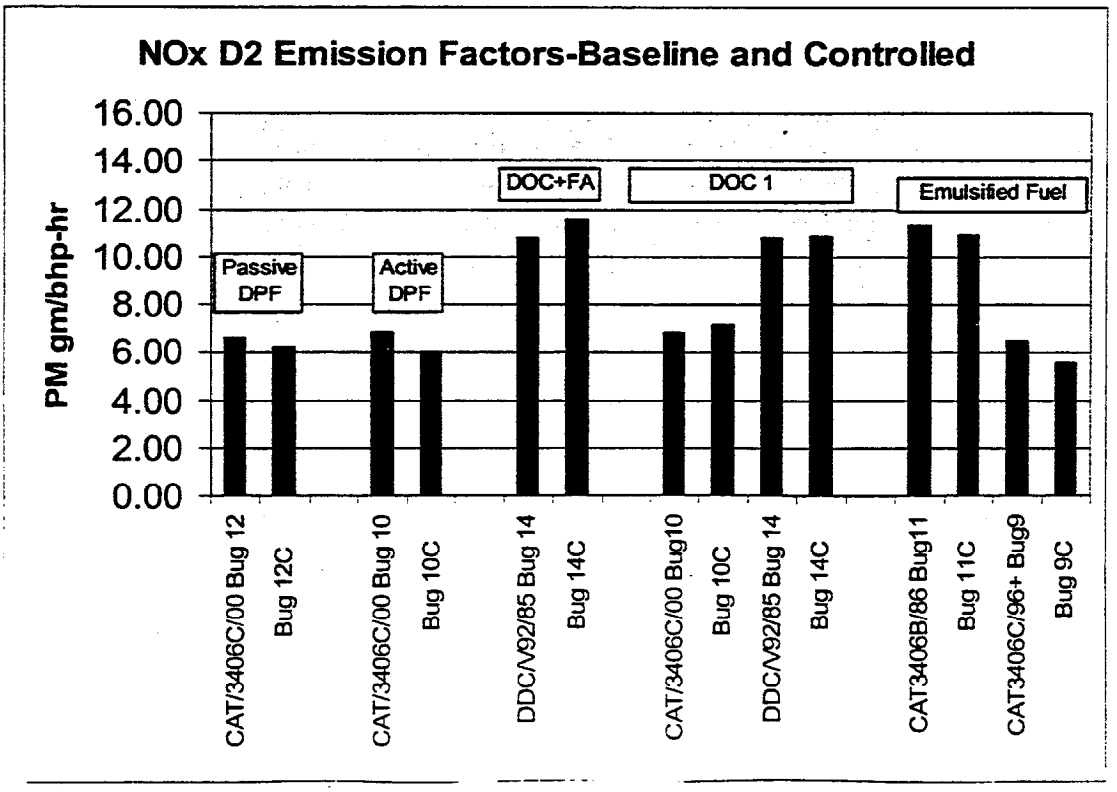
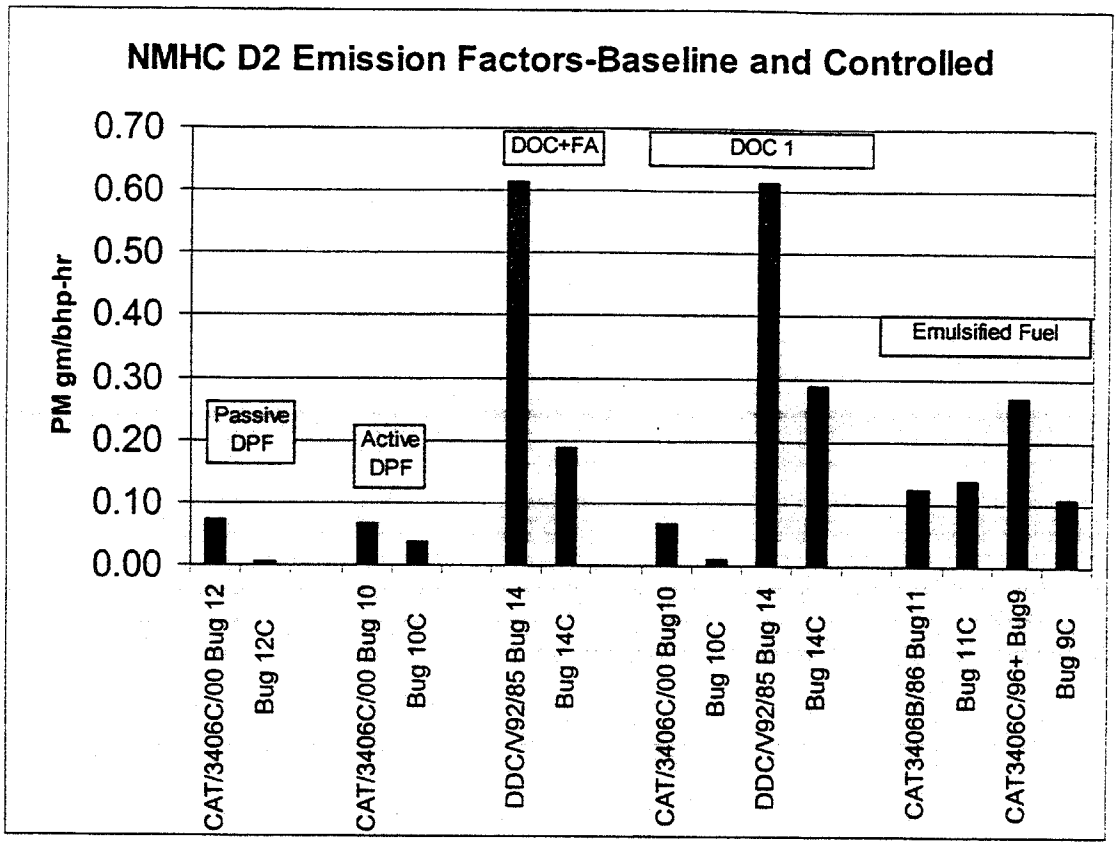


Figure H-5: Average D2 Weighted NMHC Emission Factors for Baseline and Controlled Engine Testing



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California Air Resources Board. *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines*, Chapter 14, Title 13, California Code of Regulations, sections 2700 through 2710. Adopted May 16, 2002. (ARB, 2002)

Standards for Diesel Fuel, Title 13, California Code of Regulations, sections 2281 and 2282. (CCR Title 13, Sections 2281, 2282)

Presentation by Wayne Miller, University of California, Riverside, Center for Environmental Research and Testing, *Conduct Field Tests of BUGs Units and Controls*, California Energy Commission Backup Generators Advisory Committee Meeting, November 14, 2001. (CE-CERT, 2001)

Presentation by Wayne Miller, University of California, Riverside, Center for Environmental Research and Testing, *The California Demonstration Program for Control of PM from Diesel Backup Generators*, U.S. Department of Energy's 9th Diesel Engine Emissions Reductions Conference, Newport, Rhode Island, August 24-28, 2003. (CE-CERT, 2003)

Appendix I

Cost Analysis - Basis for Calculations

I. Capital Cost Estimates of Diesel Emission Controls and Purchase of New Engines

The estimated capital costs ($/hp) for installation of a DPF was derived from actual costs for DPF installations in California. Table I-1 lists 16 of the 49 known installations of DPFs on emergency generators in California. These 16 were chosen because cost information was available. Most of this information was used to develop equations relating the size of the generator to the cost of the DPF. However, four of these 16 installations (indicated in italics in Table I-1 below) were not used in the development of the equations due to questionable cost data, or because the cost included additional equipment not related to the DPF. Table I-2 lists the 12 emergency diesel engines with a DPF actually used to relate engine size to DPF costs. Figures I-1 graphically represents this relationship and the resulting trend line and equation in terms of total DPF costs and installation costs. These equations are used to calculate the values presented in Chapter IX, Tables IX-4, IX-5, IX-9, IX-11, IX-13, IX-14, and IX-16.

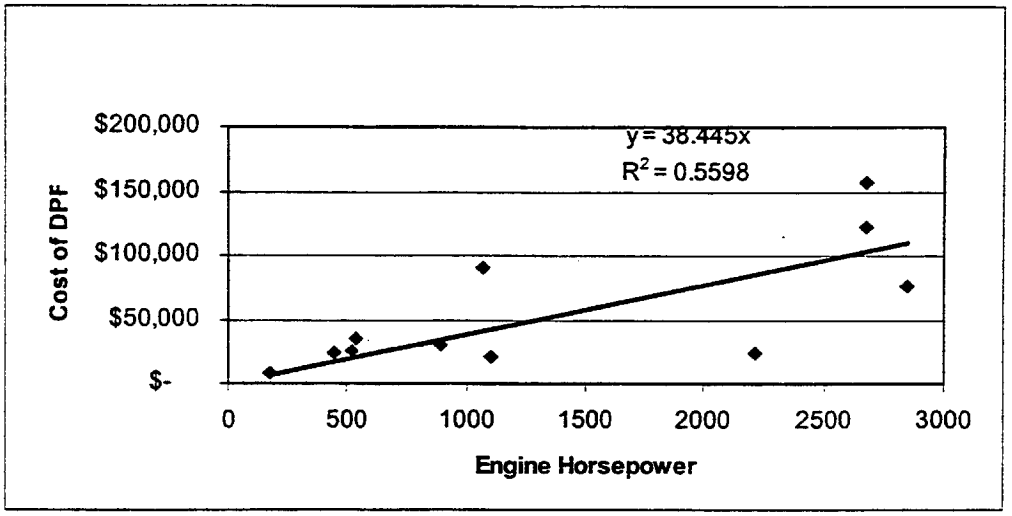
Table I-1: List of Emergency Generators with Installed Diesel Particulate Filters and Available Cost Information

		Engine			DPF			Engine
Obs	Facility Type	Make	Model	HP	Age	Capital	Install	Price
1	Public Works	Caterpillar	3516B	2848	2001	$ 76,000		$317,002
2	Medical Center	Caterpillar		2680	2001	$121,750	$ 35,000	$616,250
3	Candy Company	Caterpillar	3516 B	2680	2001	$ 74,500	$ 47,000	$288,000
4	*Communication*	*Caterpillar*	*3516*	*2479*	*1993*	*$100,000*		
5	*Communication*	*Caterpillar*	*3516*	*2479*	*1993*	*$100,000*		
6	*Communication*	*Caterpillar*	*3516*	*2479*	*1993*	*$100,000*		
7	Data	Cummins	KTTA 50-G2	2220	1997	$ 24,000		
8	*Communication*	*Cummins*	*KTA50-G9*	*2200*	*2001*	*$ 10,000*		
9	Brewery	Caterpillar	3412 DISTA	1100	1999	$ 20,000		
10	Data	Caterpillar		1072	2001	$ 90,000		
11	Communication	Caterpillar	3412C	896	2000	$ 20,000	$ 10,000	$ 90,000
12	Data	Caterpillar		536	2001	$ 35,000		
13	Medical Center	Caterpillar	3406	519	2002	$ 26,000		
14	Communication	Caterpillar	3406	449	2000	$ 20,000	$ 3,600	$ 50,000
15	Hotel	Caterpillar		175	Soon	$ 8,500		
16	Hotel	Caterpillar		175	Soon	$ 8,500		

Table I-2: List of Emergency Generators with Installed Diesel Particulate Filters and Useful Cost Information

		Engine			DPF			
Obs	Facility Type	Make	Model	HP	Age	Capitol	Install	Total
1	Public Works	Caterpillar	3516B	2848	2001	$ 76,000		$ 76,000
2	Medical Center	Caterpillar		2680	2001	$121,750	$ 35,000	$156,750
3	Candy Company	Caterpillar	3516 B	2680	2001	$ 74,500	$ 47,000	$121,500
7	Data	Cummins	KTTA 50-G2	2220	1997	$ 24,000		$ 24,000
9	Brewery	Caterpillar	3412 DISTA	1100	1999	$ 20,000		$ 20,000
10	Data	Caterpillar		1072	2001	$ 90,000		$ 90,000
11	Communication	Caterpillar	3412C	896	2000	$ 20,000	$ 10,000	$ 30,000
12	Data	Caterpillar		536	2001	$ 35,000		$ 35,000
13	Medical Center	Caterpillar	3406	519	2002	$ 26,000		$ 26,000
14	Communication	Caterpillar	3406	449	2000	$ 20,000	$ 3,600	$ 23,600
15	Hotel	Caterpillar		175	Soon	$ 8,500		$ 8,500
16	Hotel	Caterpillar		175	Soon	$ 8,500		$ 8,500

Figure I-1: Existing California DPF Total Costs



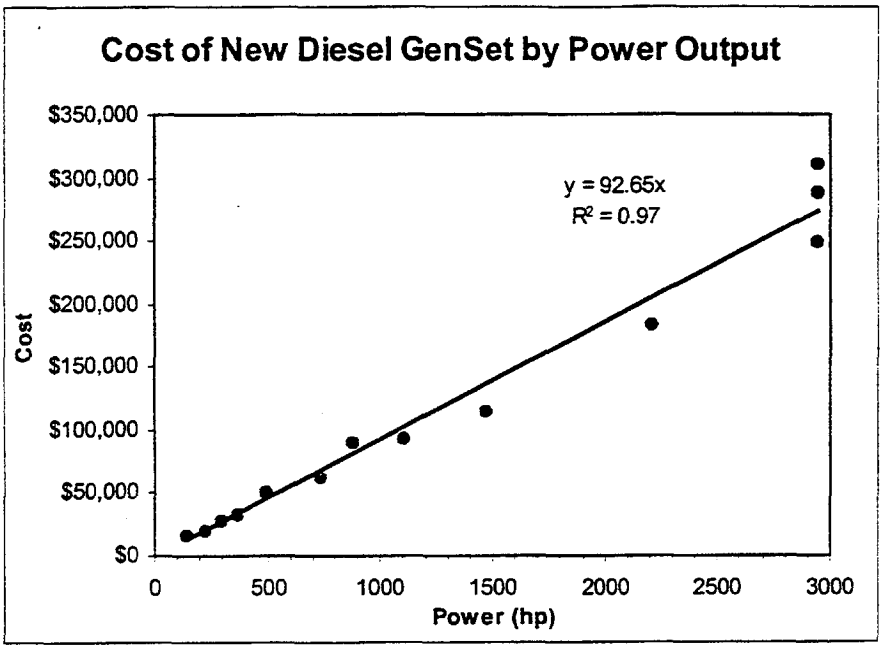
Based on this regression, we estimate the costs for DPFs to be approximately $38 dollars per horsepower.

The estimated capital costs ($/hp) for a the purchase of new diesel engine was derived from actual costs for diesel generators installed in California and calling dealerships. Table I-3 lists costs of diesel generators of various sizes in California. This information was used to develop an equation relating the size of the generator to the cost. Figure I-2 graphically represents this relationship and the resulting trend line and equation in terms of total generator costs versus power output. These equations are used to calculate the values presented in Chapter IX.

Table I-3: List of New Diesel Generators Costs

Manufacturer	kW	HP	Price
Cummins	100	147	$ 16,000
Cummins	150	221	$ 20,000
Cummins	200	295	$ 28,000
Cummins	250	368	$ 33,000
Caterpillar	335	493	$ 50,000
Cummins	500	736	$ 62,000
Caterpillar	600	884	$ 90,000
Cummins	750	1104	$ 93,000
Cummins	1000	1473	$ 115,000
Cummins	1500	2209	$ 183,000
Cummins	2000	2945	$ 248,000
Caterpillar	2000	2945	$ 288,000
Caterpillar	2000	2945	$ 311,380

Figure I-2: New Generator Costs in California



Based on this regression, we estimate the costs for new diesel generators to be approximately $92.65 dollars per horsepower.

II. Summary of In-use Diesel Fueled Stationary Engine Population and Costs

Table I-4 summarizes the stationary in-use diesel engine statistics and associated costs. Data for both private and public engine ownership is provided. The public engines are further subcategorized by local, State, and federal owned. The numbers in this table with parenthesis around them are negative values representing cost savings. All the values are combined emergency standby (E/S) and prime engines unless otherwise indicated.

Table I-4: Population and Cost for In-Use Diesel-Fueled Engines

Category	Summary of Total In-Use Engines					
	All	Private	Public	Local	State	Federal
State Wide Installation Cost ($)	$ 45,990,000	$ 35,950,000	$ 10,740,000	$ 6,350,000	$ 750,000	$ 3,640,000
Annual Maintenance & Fuel Cost ($)	$ (52,000)	$ 691,000	$ (32,000)	$ 4,000	$ (100,000)	$ 41,000
Annualized Cost ($)	$ 7,757,000	$ 6,672,000	$ 1,511,000	$ 1,025,000	$ 13,000	$ 632,000
Annualized E/S Cost ($)	$ (679,000)	$ 33,000	$ (99,000)	$ (36,000)	$ (97,000)	$ 14,000
Annualized Prime Cost ($)	$ 8,437,000	$ 6,640,000	$ 1,610,000	$ 1,062,000	$ 109,000	$ 619,000
# of Engines retrofitted	1,559	1,211	348	212	26	109
# of E/S Engines retro	232	167	65	45	9	12
# of Prime Engines retro	1,327	1,044	283	167	17	98
Population of Engines	20,987	10,796	10,191	5,600	899	3,692
Pop. of E/S Engines	19,660	9,752	9,908	5,432	882	3,594
Pop. of Prime Engines	1,327	1,044	283	167	17	98
Local Ann. Cost Inspect	$ 378,500	$ 226,300	$ 152,100	$ 84,600	$ 12,800	$ 54,700

III. Statewide Annual and Total Costs for Businesses

Table I-5 presents the estimated statewide costs to business having prime and emergency standby engines. The categories are in-use emergency standby and prime, new emergency standby and prime, and new agriculture.

Table I-5: Statewide Annual Costs

Equipment Category		Total Capital Cost ($)	Annualized Capital Cost ($)	Annual Recurring Costs ($)	Total Annualized Cost ($)
In-use	Prime	$ 33,652,844	$ 5,965,565	$ 674,066	$ 6,639,630.00
	E/S	$ 2,296,060	$ 162,911	$ -130,132	$ 32,779
New	Prime	$ 529,765	$ 75,427	$ 417	$ 75,844
	E/S			$ 7,431	$ 7,431
	Agriculture			$ 2,120	$ 2,120
Total		$ 36,478,669	$ 6,203,902	$ 553,902	$ 6,757,805

IV. Stationary Prime Diesel Engines Assumptions

Table I-6 lists the statewide in-use prime engine information used as the basis for calculating the costs and PM emissions. For in-use prime engines, 80% of the engine

population is assumed to be retrofitted with an 85% emission reduction device, while the remaining 20% are assumed to retrofit their engines to meet a 30% emission reduction and then purchase a new engine meeting Tier IV requirements in 2011. For example, for 50-175 horsepower, low use engines shown in Table I-6 below, 169 of 211 engines are expected to be retrofitted to achieve an 85% reduction, and 42 are expected to be retrofitted to achieve a 30% reduction, with and engine replacement in 2011.

Table I-6: Statewide In-use Prime Engine Size, Use, and PM Emissions Rate Characteristics

State Inventory =		1327	2002 inventory DEPICT					
Prime Engines								
HP Range	0-500 hrs =Low Use or 500+ =High use	# Engines	Avg. Size (hp)	Load	Avg. Annual Hours	Current PM (g/bhp-hr)	New PM (g/bhp-hr)	Reduction Required
50-175	Low Use	169	127	0.50	103	0.55	0.0825	85%
50-175	Low Use	42	127	0.50	103	0.55	0.385	30%
50-175	Low Use	42	127	0.50	103	0.55	0.01	New Eng after 2011
50-175	High Use	115	118	0.32	1246	0.5	0.075	85%
50-175	High Use	29	118	0.32	1246	0.5	0.35	30%
50-175	High Use	29	118	0.32	1246	0.5	0.01	New Eng after 2011
175-750	Low Use	230	321	0.61	132	0.38	0.057	85%
175-750	Low Use	57	321	0.61	132	0.38	0.266	30%
175-750	Low Use	57	321	0.61	132	0.38	0.01	New Eng after 2011
175-750	High Use	264	413	0.45	1519	0.38	0.057	85%
175-750	High Use	66	413	0.45	1519	0.38	0.266	30%
175-750	High Use	66	413	0.45	1519	0.38	0.01	New Eng after 2011
750+	Low Use	47	1187	0.49	71	0.3	0.045	85%
750+	Low Use	12	1187	0.49	71	0.3	0.21	30%
750+	Low Use	12	1187	0.49	71	0.3	0.01	New Eng after 2011
750+	High Use	237	1492	0.60	2168	0.3	0.045	85%
750+	High Use	59	1492	0.60	2168	0.3	0.21	30%
750+	High Use	59	1492	0.60	2168	0.3	0.01	New Eng after 2011

V. Stationary Emergency Standby Diesel Engines Assumptions

Table I-7 lists the statewide in-use emergency standby engine information used as the basis for calculating the costs and PM emissions. As shown, the estimated PM emission rate varies with the age of the engine, and its horsepower rating.

Table I-7: Statewide In-use Emergency Standby Engine Population, Size, and PM Emissions Rate Characteristics

Model Year Range	Horsepower Range	# Engines	Average HP	Existing PM Emission Rate (g/bhp-hr)
Pre 1987	<=250	2597	140	0.55
Pre 1987	>250	3883	613	0.53
1988-2002	<=250	5177	131	0.38
1988-1995	250<=750	2456	416	0.38
1988-1999	>750	3149	1224	0.38
1996-2001	250<=750	1624	423	0.15
2000-2002	>750	709	1674	0.15
2002	250<=750	66	409	0.12

VI. Annual Cost Effectiveness

Table I-8 lists the estimated statewide annual costs, PM emissions reduced (based on the ARB emissions inventory), and resulting cost effectiveness. The figures are provided for 2005 through 2020, and vary with the implementation of the various regulatory provisions for different types of stationary diesel engines.

Table I-8: Statewide Annual Costs, PM Reduced, and Resulting Cost Effectiveness

Year	Sum Annual Costs ($)	Inventory Based PM Reduced	Cost Effectiveness	
		(tons/yr)	($/tons)	($/lb)
2005	$ 1,354,316	145	$ 8,043	$ 4.02
2006	$ 3,108,844	125	$ 20,391	$ 10.20
2007	$ 4,693,204	114	$ 32,388	$ 16.19
2008	$ 6,119,622	103	$ 44,179	$ 22.09
2009	$ 5,842,752	93	$ 44,416	$ 22.21
2010	$ 5,578,374	73	$ 51,459	$ 25.73
2011	$ 5,409,320	76	$ 45,996	$ 23.00
2012	$ 5,159,407	68	$ 46,636	$ 23.32
2013	$ 4,135,495	61	$ 39,895	$ 19.95
2014	$ 3,197,399	54	$ 33,069	$ 16.53
2015	$ 2,358,752	51	$ 24,349	$ 12.17
2016	$ 1,592,726	42	$ 19,248	$ 9.62
2017	$ 1,336,349	36	$ 17,636	$ 8.82
2018	$ 1,100,777	32	$ 15,999	$ 8.00
2019	$ 900,639	27	$ 14,566	$ 7.28
2020	$ 717,067	23	$ 12,874	$ 6.44
		Weighted Average =	$ 30,821	$ 15.41

Table I-9 presents another cost effectiveness based on the reduction in reactive organic gases (ROG) and oxides of nitrogen (NOx) combined. The total statewide annual costs were split evenly between PM and ROG+NOx, such that half of the total statewide annual costs were used along with the associated ROG+NOx reductions. As shown in Table I-9, the resulting cost effectiveness value of the years 2005-2020 is $0.92 per pound of ROGF+NOx reduced. The resulting PM cost effectiveness (which is not shown in Table I-9) is simply half the value presented in Table I-8, or $7.70 per pound of PM reduced.

Table I-9: Statewide Annual Costs, ROG and NOx Reduced, and Resulting Cost Effectiveness

Year	Sum Annual Costs ($)	Inventory Reduced			ROG+NOx Cost Effectiveness	
		ROG (tons/yr)	NOx (tons/yr)	ROG+NOx (tons/yr)	($/ton)	($/lb)
2005	$ 677,158	165	418	583	$ 1,162	$ 0.58
2006	$ 1,554,422	157	306	463	$ 3,358	$ 1.68
2007	$ 2,346,602	149	389	538	$ 4,360	$ 2.18
2008	$ 3,059,811	141	455	596	$ 5,131	$ 2.57
2009	$ 2,921,376	133	530	663	$ 4,407	$ 2.20
2010	$ 2,789,187	126	352	478	$ 5,839	$ 2.92
2011	$ 2,704,660	118	679	796	$ 3,396	$ 1.70
2012	$ 2,579,704	110	753	863	$ 2,989	$ 1.49
2013	$ 2,067,748	102	828	930	$ 2,224	$ 1.11
2014	$ 1,598,699	94	902	997	$ 1,604	$ 0.80
2015	$ 1,179,376	87	897	983	$ 1,199	$ 0.60
2016	$ 796,363	79	1,051	1130	$ 705	$ 0.35
2017	$ 668,174	71	1,126	1197	$ 558	$ 0.28
2018	$ 550,388	63	1,200	1263	$ 436	$ 0.22
2019	$ 450,320	55	1,275	1330	$ 339	$ 0.17
2020	$ 358,533	48	1,485	1532	$ 234	$ 0.12
Weighted Average =					$ 1,834	$ 0.92

VII. Impacts on Business

To comply with State law, ARB staff evaluated the impacts to a typical business and a typical small businesses. Our analysis is presented below.

Estimated Typical Business Impacts

Many businesses do not own any diesel-fueled stationary engines. Based on the ARB Survey, for those businesses that do have stationary diesel-fueled engines, the average business owns 2.5 emergency standby engines of 700 horsepower, or three prime engines of 560 horsepower.[1] The ARB survey of prime engines had a low response rate. The State inventory average prime engine size is 590 horsepower. Since the survey data and State inventory data are very close, the State inventory average prime engine size was used for the cost calculations.

[1] We believe this may be an overestimate of the number of engines owned by a typical business. Some of the telecommunication businesses own hundreds of engines, which may have biased the average.

According to the data collected, most businesses that own an emergency standby engine will not need to install DECS, and for those that do, the majority can use the less expensive diesel oxidation catalyst. The costs to a business with a typical size emergency standby engine could range from $250 to $16,750. The low end of the cost range reflects businesses that will not have to install retrofits (ie., no equipment cost). The upper end reflects businesses that will retrofit emergency standby engines with DOCs at an average capital cost $6,700 each. Because the average private business that owns an emergency standby stationary diesel-fueled CI engine has 2.5 engines, the potential capital cost to a business is estimated to be $16,750.

If a business owns a prime engine, that doesn't already meet the ATCM requirements, then retrofit with a DPF or DOC would be necessary. According to our survey, the average prime engine owned by a small business is approximately the same horsepower rating (540 hp) as a prime engine owned by a typical business (560 hp). Because this average is fairly close to the average horsepower of a prime engine owned by a small business, we used the overall average horsepower of 590 to simplify our cost analyses. This results in a conservative cost estimate. Therefore, the average capital cost to retrofit a prime engine ($19,200) is approximately the same for a typical business owning a prime engine or a small business owning a prime engine. Since a typical business owning a prime engine owns 3 of them and a small business owning prime engines has 1.75, the cost ranges from $57,600 to $33,600.

The annual ongoing costs are based on a reporting cost of $100 per engine per year and an estimated per-engine annualized cleaning cost of $1.33/hp engine size every 1,500 hours. This results in annual ongoing costs averaging $100 for emergency standby and $650 for prime per engine per year. Because the average business owns 2.5 emergency standby engines or 3 prime engines, the estimated recurring costs are $250 to $1,950 for businesses that own an emergency standby or prime stationary diesel engine(s).

Estimated Small Business Impacts

The cost to a typical small business is derived from the average size and number of engines owned. Most small businesses in California do not own any diesel-fueled stationary engines. Based on the ARB Survey, for those small businesses that do have stationary diesel-fueled engines, the average small business owns 1.5 emergency standby engines with an average horsepower of 500, and 1.75 prime engines, with an average horsepower of 540. The overall average horsepower for all prime engines reported in the ARB Survey was 590 bhp. Because this average is fairly close to the average horsepower of a prime engine owned by a small business, we used the overall average horsepower of 590 to simplify our cost analyses. Therefore, the average capital cost to retrofit a prime engine ($19,200) is approximately the same for a typical business owning a prime engine or a small business owning a prime engine. This results in a conservative cost estimate.

As with all businesses, most small businesses that own emergency standby diesel-fueled CI engines will not need to install DECS. However, the ARB Survey revealed that small businesses have a higher percentage of older and dirtier engines that may require a control device such as a DOC. Even though a small business emergency standby engine is slightly smaller than a typical business emergency standby engine, the increased age and emission rate may require a slightly more expensive DOC. Staff assumed that the average capital cost to retrofit an emergency standby engine is approximately the same for a typical business owning an emergency standby engine or a small business owning an emergency standby engine. This results in a conservative cost estimate. The costs to a small business with a typical size emergency standby engine could range from $150 to $10,200. The lower end of the range given for "emergency standby" reflects the small businesses with engines not requiring installation of DECS (no equipment cost, only reporting cost). The upper end of the range reflects capital and associated recurring costs for small businesses needing to retrofit 1.5 engines at a cost of $10,200 (average capital cost of $6,700 per engine plus $100 for reporting).

Any prime engine operated by a small business ,that doesn't already meet the ATCM requirements, would require installation of a DECS. Capital costs would range from $11,000 to $147,000. The average small business with a prime engine is expected to have initial costs of about $33,600 based on the average size and number of prime engines owned.

The annual ongoing costs are based on a reporting cost of $100 per engine per year and an estimated annualized DPF cleaning cost of $1.33 per horsepower engine size conducted every 1,500 hours. This results in reporting and cleaning costs averaging $100 for emergency standby engines and $650 for prime engines per engine per year. Because the average small business owns 1.5 emergency standby engines or 1.75 prime engines, the estimated costs range from $150 to $1,134 for small businesses that own an engine or engines. Table I-9 lists the costs identified in sections VII and VIII.

Table I-9: Estimated Typical and Small Business Retrofit Costs

Stationary Engine Category		Typical # of engines	Average Size	Recurring Costs	Capital Costs per Engine	Total Recurring Costs	Total Capital Costs
Typical Business	E/S	2.5	700	$ 100	$ 6,700	$ 250	$ 16,750
	Prime	3	590	$ 650	$ 30,100	$ 1,950	$ 90,300
Small Business	E/S	1.5	500	$ 100	$ 6,700	$ 150	$ 10,050
	Prime	1.75	590	$ 650	$ 30,100	$ 1,138	$ 52,675

Appendix J

Air Resources Board Comments to U.S. EPA on the Proposed National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE)

'inston H. Hickox
;ency Secretary

Air Resources Board

Alan C. Lloyd, Ph.D.
Chairman
1001 I Street • P.O. Box 2815 • Sacramento, California 95812 • www.arb.ca.gov

Gray Davis
Governor

February 20, 2003

Attention: Docket ID No. OAR-2002-0059
EPA West (Air Docket)
U.S. Environmental Protection Agency (MD-6102T)
Room B-108
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460

Dear Sir or Madam:

The California Air Resources Board (ARB) staff is providing comments on the proposed National Emission Standards for Hazardous Air Pollutants (NESHAP) for Stationary Reciprocating Internal Combustion Engines (RICE). We have serious concerns with the proposal and request that the RICE NESHAP include a provision to exempt stationary diesel IC engines in California that meet the requirements of California's Stationary Diesel Engine Airborne Toxic Control Measure (ATCM). Our comments, which are briefly summarized below and provided in detail in the attachment to this letter, are directed at the portion of the proposed RICE NESHAP regulating stationary diesel engines.

As you know, the ARB has a long history of successfully implementing effective measures to reduce emissions of air toxics in California. With respect to diesel engines, the ARB has been involved in efforts to reduce the emissions and the associated health impacts of diesel exhaust since the late 1980s. In 1998, the ARB identified diesel particulate matter (PM) as a toxic air contaminant. In September 2000, the ARB adopted the *Diesel Risk Reduction Plan,* an aggressive plan that established a goal of achieving a 75 percent reduction in diesel PM emissions by 2010. Also, in September 2000, the ARB approved the *Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines* (Risk Management Guidance). The Risk Management Guidance recommends that catalyzed diesel particulate filters (DPFs) be required for all new prime (non-emergency) diesel engines. Catalyzed DPFs can achieve an 85 percent reduction in diesel PM, and a 90 percent reduction in organic gases and carbon monoxide. Since adoption of the Risk Management Guidance, the local air pollution control districts have been implementing the recommendations, and to date, well over 50 stationary diesel engines have been placed in service with DPF controls.

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our Website: http://www.arb.ca.gov.

California Environmental Protection Agency

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The Risk Management Guidance was a first step in our efforts to address the toxic emissions from stationary diesel engines. To achieve further reductions from this source category, over the last two years, ARB staff has been developing a statewide ATCM that will reduce diesel exhaust emissions from both new and in-use stationary diesel engines. The proposed regulation requires catalyzed DPFs on all prime stationary diesel engines. We anticipate rulemaking action on this regulation in July 2003. More information on this effort and the current draft of this regulation is available at http://www.arb.ca.gov/diesel/documents.htm.

Our fundamental concern with the proposed RICE NESHAP is that it will create conflicting requirements in California for new diesel engines, unnecessarily increase costs to California businesses, and result in no emission reduction benefits. Briefly, our key issues associated with the proposal are as follows:

- The RICE NESHAP is not health protective because it only regulates organic gases and ignores diesel PM. A more health protective approach for addressing the risk from stationary diesel engines is to reduce emissions of diesel PM.
- The RICE NESHAP does not recognize diesel particulate filters (DPFs) as a significantly more effective control device for reducing diesel exhaust emissions compared to diesel oxidation catalysts (DOCs).
- The RICE NESHAP recordkeeping, reporting, monitoring, and testing requirements are not appropriate for diesel engines meeting a diesel PM emission standard.
- The definition of "reconstruction" should be modified to exclude the cost associated with complying with State and local emission standards.
- The RICE NESHAP requirements are not sufficient to meet the risk reduction goals of the Urban Air Toxic Strategy.

As mentioned previously, these are significant issues for California. To address our concerns, we recommend that a provision be added to the RICE NESHAP exempting diesel engines that comply with the ARB adopted Stationary Diesel Engine ATCM provided that ARB demonstrates that the applicable emission standards are at least as stringent those in the RICE NESHAP.

We believe this approach is consistent with the intent of 40 CFR, Title II, Section 209 which gives California the authority to establish new and in-use standard for nonroad engines. We also believe that providing an exemption in the RICE NESHAP is a more practical approach than seeking equivalency under the Section 112(l) process.

Thank you for this opportunity to comment on the RICE NESHAP. Should you have questions regarding these comments please contact me at (916) 322-6023.

Sincerely,

/s/

Daniel E. Donohoue, Chief
Emissions Assessment Branch
Stationary Source Division

Enclosure

cc: Jack Broadbent, EPA Region 9
Mary Sullivan Douglas, STAPPA/ALAPCO
Barbara Lee, CAPCOA
Stew Wilson, CAPCOA
Sally Shaver, EPA OAQPS ESD
Sims Roy EPA OAQPS ESD CG

Air Resources Board Comments on the Proposed National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

Recommendation

To address the issues raised below, we recommend that the RICE NESHAP include a provision to exempt stationary diesel engines in California that meet the requirements of California's Stationary Diesel Engine Airborne Toxic Control Measure (ATCM).

Comments

1. **The RICE NESHAP should allow S/L to regulate diesel PM as a more health protective alternative for addressing the risk from diesel exhaust.**

   - In 1998, particulate matter for diesel-fueled engines (diesel PM) was recognized by the California Air Resources Board (ARB) as the toxic air contaminant (TAC) that best characterized the toxic risk from diesel exhaust. The California Office of Environmental Health Hazard Assessment recommended a cancer unit risk factor (URF) of 300 excess cancers per million per microgram per cubic meter of diesel PM. Quantitatively, diesel PM has a URF that is 50 times greater than formaldehyde.

   - All major health agencies agree that adverse human health effects results from environmental exposure to diesel exhaust. From a public health perspective, focusing on diesel PM as a surrogate for whole diesel exhaust is a more health protective approach compared to focusing on only organic gases and the soluble organic fraction as proposed in the RICE NESHAP.
     - The California Air Resources Board identified diesel PM as a toxic air contaminant in 1998 after 10 years of study and debate. (See references).
     - A consistent relationship between occupational diesel exhaust exposure and lung cancer was found in more than 30 human epidemiological studies (Diesel ID Doc, OEHHA 1998).
     - Over 95 percent of the particulate matter emitted from diesel engines is 2.5 microns or less in size. Reducing diesel PM will reduce PM mortality and other adverse health effects such as increases in asthma and bronchitis (Lloyd & Cackette, AWMA, June 2001).
     - If one calculates the potential cancer risk from a diesel engine meeting the proposed formaldehyde standard, an engine could operate 24 hours a day, 365 days a year, and result in a 70 year potential cancer risk of less than 0.1 in a million. However, the same engine could only operate about

eighty (80) hours per year before reaching a potential cancer risk of 0.1 in a million when ARB's diesel PM unit risk factor of 300 cancer/ug/m^3 is used.

2. **The RICE NESHAP should recognize diesel particulate filters (DPFs) as a significantly more effective control device for reducing diesel exhaust emission compared to diesel oxidation catalysts (DOCs).**

- Diesel oxidation catalysts (DOCs) are not as effective as diesel particulate filters (DPFs) in reducing diesel exhaust emissions and the associated health risk.
  - DOCs reduce mainly the organic gases and soluble organic fraction of diesel exhaust. Catalyzed DPFs reduce organic gases, soluble organic fraction, semi-volatile organic compounds, organic carbon particulate matter, and elemental carbon particulate matter.
  - DPFs reduce diesel PM over the entire particulate size range including ultrafine particulate matter. DOCs do not reduce ultrafine particulate matter.
  - DPFs have demonstrated 85 percent reduction in diesel PM and 90 percent reduction in formaldehyde and carbon monoxide. DOCs have demonstrated 20 to 30 percent reduction in diesel PM and 70 percent reduction in formaldehyde and carbon monoxide.

- The use of DOCs to reduce diesel exhaust emissions is not consistent with U.S. EPA's approach for reducing diesel emissions from on-road and off-road engines.
  - The 2007 on-road heavy-duty diesel engines will need to meet a 0.01 grams per brake horsepower hour (g/bhp-hr) standard for PM. Off-road diesel engines, greater than 500 hp, currently meet a 0.15 g/bhp-hr PM standard. We expect these standards to be reduced to 0.01 g/bhp-hr in the 2010 to 2012 time frame. Meeting these standards will require catalyzed DPF technology.
  - The majority of engines supplied to California for stationary applications currently are nonroad engines certified to meet ARB and EPA's nonroad engine certification standards.
  - At a minimum, all new stationary diesel engines should meet the nonroad engine certification standards.

3. **The recordkeeping, reporting, monitoring, and testing requirements in the RICE NESHAP are not appropriate for diesel engine meeting a diesel PM emission standard.**

- The recordkeeping, reporting, monitoring, and testing requirements in the RICE NEHSAP focus on formaldehyde and carbon monoxide. These provisions are not appropriate for emission standards based on diesel PM.

- The continuous emissions monitoring requirements in the proposed RICE NESHAP will more than double the compliance cost if these requirements must be met in addition to complying with the parameter monitoring requirements in the proposed Stationary Diesel Engine ATCM.

- The annual source-testing requirement in the proposed rule is not necessary, appropriate, or cost effective for engines equipped with a DPF control system.

4. The definition of "reconstruction" should be modified to exclude the cost associated with complying with S/L emission standards.

- The "reconstruction" definition should be modified to exclude costs associated with adding control systems or making engine modifications required by state or local agencies. The proposed Stationary Diesel Engine ATCM requires in-use prime (non-emergency) diesel engines to reduce emissions by 85 percent or meet a PM standard of 0.01 g/bhp-hr. Meeting this standard will require the installation of catalyzed DPF control technology. Given that the current cost of a catalyzed DPF is about $40/bhp-hr, simply adding emission controls could exceed the reconstruction cost threshold. As a result, engines that normally would not be subject to the RICE NESHAP would become subject simply by taking actions to significantly reduce diesel engine emissions.

5. The RICE MACT requirements are not sufficient to meet the risk reduction goals of Urban Air Toxic Strategy.

- The proposed RICE NESHAP would effect a limited number of engines and achieve an emission reduction from these engines of less than 30 percent, far below the goal of a 75 percent reduction in air toxics specified in the Integrated Urban Air Toxic Strategy.

References

Executive Summary for The Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant
http://www.arb.ca.gov/regact/diesltac/diesltac.htm
http://www.arb.ca.gov/toxics/dieseltac/finexsum.pdf

California's Diesel Risk Reduction Program
http://www.arb.ca.gov/diesel/documents/rrpapp.htm

California's Diesel Risk Reduction Program, Stationary/Portable
http://www.arb.ca.gov/diesel/statport.htm

Risk Management Guideline for the Permitting of New Stationary Diesel-Fueled Engines
http://www.arb.ca.gov/diesel/documents/rmg.htm

Draft ATCM for New Stationary Diesel Fueled Engines
http://www.arb.ca.gov/diesel/documents/111902draftatcm-new.pdf

Draft ATCM for In-Use Diesel Fueled Engines
http://www.arb.ca.gov/diesel/documents/111902draftatcm-inuse.pdf

Diesel Engines: Environmental Impact and Control, Alan C. Lloyd & Thomas A. Cackette, California Air Resources Board, published in the Journal of the Air & Waste Management Association, Volume 51, June 2001.
http://www.arb.ca.gov/research/seminars/lloyd/AWMA2001/AWMA2001.htm

Appendix K

List of Acronyms and Abbreviations

LIST OF ACRONYMS AND ABBREVIATIONS

AB	Assembly bill
ARB, or the Board	Air Resources Board
APCO	Air Pollution Control Officer
ATCM	Airborne Toxic Control Measure
B100	100% biodiesel
B50	50% biodiesel / 50% diesel fuel
BACT	Best available control technology
Bhp	Brake horsepower
°C	Degrees Celsius
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resource Board
CCAA	California Clean Air Act
CCR	California Code of Regulations
CHAPIS	Community Health Air Pollution Information System
CEQA	California Environmental Quality Act
CI	Compression ignition
CNG	Compressed natural gas
CCEEB	Council for Economic and Environmental Balance
CRT	Continuously Regenerating Trap
DDC	Detroit Diesel Corporation
DECS	Diesel Emission Control System or Strategy
DG	Distributed Generation
DOC	Diesel Oxidation Catalyst
DOF	Department of Finance
$/lb	Dollars per pound
DPF	Diesel particulate filter
Diesel PM	Diesel Particulate Matter
DRRP, or Diesel Risk Reduction Plan	Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles Risk Reduction Plan
DHS	Department of Health Services
DTSC	Department of Toxic Substances Control
EO	Executive Officer of the Air Resource Board
EQIP	Environmental Quality Incentives Program
ES Survey	Emergency Stand-by diesel fueled engine survey
°F	Degrees Fahrenheit
FM	Factory Mutual
FTF	Flow-through filter
g/bhp-hr	Grams per brakehorsepower-hour
HSC Sections 39600	General Powers
EMD	General Motors Electro-Motive Division
>	Greater than

522

HC	Hydrocarbon
HRA	Health Risk Assessment
H&SC	California Health and Safety Code
ISC	Interruptible Service Contract
ISO	International Standards Organization
ISOR	Initial Statement of Reasons
≤	Less than or equal to
LAER	Lowest Achievable Emission Rate
LPG	Liquefied petroleum gas
Low sulfur diesel fuel	Diesel fuel with less than 15 ppmw sulfur content
$\mu g/m^3$	Microgram per cubic meter
NAAQS	National Ambient Air Quality Standard
NASA	National Aeronautical Space Administration
NESHAP	National Emission Standard for Hazardous Air Pollutants
NMHC	Non-methane hydrocarbons
NFPA	National Fire Protection Association
NO	Nitrogen oxide
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NRCS	National Resources Conservation Service
NSPS	New Source Performance Standard
NSR	New Source Review
OCS	Outer Continental Shelf
OEHHA	Office of Environmental Health Hazard Assessment
O & M	Operation and maintenance
OSHPD	Office of Statewide Health and Planning Department
PAH	Polycyclic Aromatic Hydrocarbons
PGM	Platinum group metals
PM	Particulate matter
PM_{10}	Particulate Matter range 10 microns or less in diameter
$PM_{2.5}$	Particulate Matter range less then 2.5 microns in diameter
ppmvd	Parts per million, volume dry
PTSD	Planning and Technical Support Division of ARB
POTW	Publicly-owned Treatment Works
Prime Survey	Stationary Diesel fueled Prime Engine Survey
PSD	Prevention of Significant Deterioration
ROE	Return on Owner's Equity
ROG	Reactive Organic Gases
SCR	Selective Catalytic Reduction
SIC	Standard Industrial Classification
SIP	State Implementation Program
SRP	Scientific Review Panel
SCAQMD	South Coast Air Quality Management District
SDCAPCD	San Diego County Air Pollution Control District

SJVAPCD	San Joaquin Air Pollution Control District
SMAPCD	Sacramento Metropolitan Air Quality District
SSD	Stationary Source Division of ARB
SFM	Office of the State Fire Marshals office
SOF	Soluble Organic Fraction
SOx	Sulfur Oxides
TAC	Toxic air contaminant
T-BACT	Toxic Best Available Control Technology
THC	Total Hydrocarbons
tpd	Tons per day
UL	Underwriters Lab
U. S. EPA	United States Environmental Protection Agency

TITLE 13. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER THE ADOPTION OF PROPOSED AIRBORNE TOXIC CONTROL MEASURE FOR IN-USE DIESEL-FUELED TRANSPORT REFRIGERATION UNITS (TRU) AND TRU GENERATOR SETS, AND FACILITIES WHERE TRUs OPERATE

The Air Resources Board (ARB or Board) will conduct a public hearing at the time and place noted below to consider adopting a regulation to reduce public exposure to diesel exhaust particulate matter (diesel PM) and other toxic air contaminants (TAC) by reducing in-use emissions from Transport Refrigeration Units (TRU) and TRU generator sets.

DATE: December 11, 2003

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Central Valley Auditorium
1001 I Street
Sacramento, California 95814

This item will be considered at a two-day meeting of the ARB, which will commence at 9:00 a.m., on Thursday, December 11, 2003, and may continue at 8:30 a.m., Friday, December 12, 2003. This item may not be considered until Friday, December 12, 2003. Please consult the agenda for the meeting, which will be available at least ten days before December 11, 2003, to determine the day on which this item will be considered.

If you have special accommodation or language needs, please contact the ARB's Clerk of the Board at (916) 322-5594 or sdorais@arb.ca.gov as soon as possible. TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed adoption of Chapter 3 - Article 4, section 2022, title 13, California Code of Regulations (CCR).

Background: In 1998 the Board identified diesel particulate matter emissions from diesel-fueled engines as a toxic air contaminant. Two years later, the Board adopted the Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles (Diesel Risk Reduction Plan) in September 2000, which established a goal of reducing emissions and the resultant health risk from virtually all diesel-fueled engines and vehicles within the State of California by the year 2020. This Plan envisions that particulate matter emissions from diesel-fueled engines and vehicles should be reduced by 75 percent in 2010 and 85 percent in 2020. The Plan identified various methods for achieving the goals including new, more stringent standards for all new diesel-fueled engines and vehicles, the replacement of older in-use engines with

new, cleaner engines, the use of diesel emission control strategies on in-use engines, and the use of low-sulfur diesel fuel.

The major sources of diesel PM are the approximately 1,250,000 diesel-fueled engines in vehicles and equipment used in California. The health impacts of diesel PM include increased incidence of lung cancer, chronic respiratory problems (such as asthma and bronchitis), cardiovascular disease, and increased hospital admissions and mortality. In California, diesel PM emissions are estimated to comprise 70 percent of the total potential cancer risk from all identified toxic air contaminants.

TRU diesel engines currently emit approximately two tons per day of diesel PM. The diesel PM emissions from TRUs are expected to increase to about 2.5 tons per day in 2010, and to about three tons per day in 2020 as more TRUs are placed into service. Because of the high potency of diesel PM and the potential for large numbers of TRUs to operate at one location, often times near residential areas, staff believes that there are situations where the estimated 70-year potential cancer risk resulting from exposure to diesel PM emissions from TRUs will be in excess of a 100 in a million.

On May 16, 2002, the Board approved the *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines* (13 CCR Sections 2700-2710). This rule establishes procedures for the verification of emission control strategies by ARB that can be applied on various diesel-fueled engines and vehicles to significantly reduce diesel PM emissions.

It is important to reduce diesel PM emissions from TRUs. H&SC sections 39666 and 39667 requires the ARB to adopt regulations to achieve the maximum possible reduction in public exposure to TACs through the application of best available control technology (BACT), or a more effective control method, in consideration of cost, risk, environmental impacts, and other specified factors.

Furthermore, the Children's Environmental Health Protection Act (Stats. 1999, Ch. 731) requires the California Environmental Protection Agency to specifically consider children in setting Ambient Air Quality Standards and in developing criteria for TACs. OEHHA identified diesel PM and several other TACs associated with motor vehicle exhaust among the top priority pollutants affecting children's health.

ARB staff has prepared an Initial Statement of Reasons (ISOR) for the proposed Airborne Toxic Control Measure for *In-Use Diesel-Fueled TRUs and TRU Gen Sets, and Facilities where TRUs Operate* (proposed ATCM) that, together with the needs assessment (Diesel Risk Reduction Plan), serves as the report on the need and appropriate degree of regulation for in-use TRUs.

Description of the Proposed Regulatory Action: The proposed ATCM is designed to reduce the general public's exposure to diesel PM, other toxic contaminants, and criteria air pollutants from TRUs.

Applicability

The requirements of the proposed ATCM would affect owners and operators of "in-use" diesel-fueled TRUs and TRU generator sets that operate in California. This would include all carriers, whether based in California or out-of-state, that transport perishable goods using refrigerated trucks, trailers, shipping containers, and railcars within the state. Most TRUs are owned or operated by corporations, businesses, and individuals. There are a few local municipalities, school districts, and correctional institutions that operate TRUs that may be affected. Staff estimates that there are currently approximately 32,000 California-based TRUs, and 7,500 on-highway truck and trailer equipped TRUs, and 1,700 railcar TRUs that are based outside of California that operate in California at any given time.

Requirements for in-use TRUs

The proposed ATCM would require in-use TRU engines that operate in California, including out-of-state based TRUs that operate in California, to meet specific performance standards that vary by horsepower range. The in-use performance standards have two levels of stringency that would be phased in over time beginning in 2008. By December 31, 2008, all 2001 and earlier TRU engines that operate in California would have to meet "low emission TRU" performance standards. All 2002 TRU engines would have to meet the low emission TRU performance standard by December 31, 2009. Each subsequent model year engine (2003, 2004, etc.) would have to meet the "ultra-low emission TRU" performance standards seven (7) years after the engine model year (2003 model year engine must meet the ultra low emission TRU performance standard in 2010, 2004 model year engines in 2011, etc). In 2015, any 2001 and earlier model year engines that are still in operation would have to meet the ultra low emission TRU performance standards. In 2016, any 2002 model year TRU engines in operation would have to meet the ultra low emission TRU performance standards. The average useful life of a TRU is 10 years. The proposed ATCM in effect reduces the useful life of TRUs to 7 years. This accelerated retrofit or replacement schedule will ensure that the entire TRU fleet will be ultra low emission TRUs by 2020. The proposed TRU performance standards are as follows:

(1) For engines less than (<) 25 hp:

- Low emission TRU performance standards
  - Meet a PM emission standard of 0.3 g/bhp-hr, or
  - Retrofit with a Level 2 or 3 Verified Diesel Emission Control System (verified control system[1]), or
  - Use an alternative technology.

- Ultra low TRU performance standards
  - A PM emission standard is not being proposed at this time[2] , or

[1] Verified Diesel Emission Control Strategy means an emission control strategy designed primarily for the reduction of diesel particulate matter emissions that has been verified per the *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines (13 CCR Sections 2700-2710)*. PM reduction Level 1: ≥25%; Level 2: ≥50%; Level 3: ≥85% or 0.01 g/bhp-hr.

- Retrofit with a Level 3 verified control system, or
- Use an alternative technology.

(2) For engines equal to or greater than (≥) 25 hp:

- Low emission TRU performance standard
  - Meet a PM emission standard of 0.22 g/bhp-hr, or
  - Retrofit with a Level 2 or 3 verified control system, or
  - Use an alternative control technology.
- Ultra low TRU performance standard
  - Meet a PM emission standard 0.02 g/bhp-hr, or
  - Retrofit with a Level 3 verified emission control system, or
  - Use an alternative technology.

The PM performance standards are based on the Tier 4 nonroad standards proposed by U.S. EPA in their May 23, 2003 Notice of Proposed Rulemaking for Control of Emissions of Air Pollutants from Nonroad Diesel Engines and Fuel (hereinafter referred to as Nonroad Standards) (U.S. EPA 2003). The verified retrofit control levels are based on staff's technical evaluation of what retrofits are likely to become verified by 2008. Given this uncertainty, staff is proposing to conduct technology reviews in 2007 and 2009 to evaluate technology readiness for the in-use requirements. Part of that technology evaluation would be to consider whether more stringent emission standards are feasible in the later years of the ATCM and if so what implementation schedule is appropriate.

Alternative Technologies

TRUs that elect to use one of the "alternative technologies" listed in the ATCM would qualify as an ultra low TRU. These alternative technologies include the use of electric standby, cryogenic temperature control systems, alternative fuel, alternative diesel fuel, fuel cell power, or any other system approved by the Executive Officer.

Incentive

The proposal includes a provision that encourages operators of model year 2002 and earlier TRU engines to comply with the low emission TRU performance standards prior to December 31, 2008 (December 31, 2009 for model year 2002 only). This incentive would allow such engines to postpone, by up to three years, the date by which that engine must be replaced or retrofitted to comply with the ultra low TRU performance standard.

Compliance Provision

Staff is proposing the use of an ARB identification numbering system. The I.D. numbers would include codes that indicated key compliance information such as model year of engine. California-based TRUs would be required to have I.D. numbers. For out-of-

[2] ARB will conduct a technology review in 2007 and determine what PM emission standard is appropriate and recommend amendment to the ATCM as needed.

state based TRUs that operate in California, the use of ARB I.D. numbers would be voluntary. However, without such a coding system an inspector would have to physically open up the TRU compartment to verify that the unit contains a complying engine or retrofit system. This could result in significant downtime for the truck. The coding allows a quick inspection so that the trucks can get back on the road as quickly as possible. Given this situation, we anticipate that most owners of out-of-state TRUs will obtain ARB I.D. numbers for their TRUs.

Initial and Annual Reporting Requirements

The proposed ATCM contains two reporting provisions. Owners of TRUs operating in California would be required to submit an initial report to ARB that provide information about the TRUs they operate in California. Updates would need to be provided as TRUs are purchased or sold. The information is needed to assist in the implementation of the ATCM. The second reporting provision applies to large facilities where TRUs operate. Distribution facilities with 20 or more doors serving a refrigerated storage area would be required to submit a one-time report to ARB. This information is needed to evaluate the overall effectiveness of the regulation in reducing diesel PM concentrations near facilities where numerous TRUs operate.

Warranty

If a Verified Diesel Emission Control Strategy (VDECS) fails during the warranty period, the owner or operator of the TRU or TRU generator set must replace it with the same VDECS or a higher verification classification level, if available.

If a VDECS fails outside its warranty period and a higher verification classification level VDECS is available, then the owner or operator of the TRU or TRU generator set shall upgrade to the highest level VDECS that is determined to be cost-effective by the Executive Officer.

Other Comparable Federal Regulations

There are no federal regulations comparable to the Proposed ATCM for in-use TRUs; however, the ATCM relies heavily on adoption and implementation of the proposed U.S. EPA's Tier 4 nonroad emissions standards for new diesel engines since engine replacement is one of many compliance pathways.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

The Board staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes a summary of the potential environmental and economic impacts of the proposal, if any. The ISOR is entitled, *Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units and TRU Generator Sets, and Facilities Where TRUs Operate.*

Copies of the ISOR and the full text of the proposed regulatory language may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, CA 95814, (916) 322-2990, at least 45 days prior to the scheduled hearing which will begin on December 11, 2003.

Upon its completion, the Final Statement of Reasons (FSOR) will also be available and copies may be requested from the agency contact persons in this notice, or may be accessed on the web site listed below.

This notice, the ISOR and all subsequent regulatory documents, including the Final Statement of Reasons, when completed, are available on the ARB Internet site for this rulemaking at http://www.arb.ca.gov/regact/trude03/trude03.htm.

Inquiries concerning the substance of the proposed regulations may be directed to the designated agency contact persons, Tony Andreoni, Manager of the Process Evaluation Section, Emission Assessment Branch, Stationary Source Division at (916) 324-6021 or by email at tandreon@arb.ca.gov, or Rod Hill, Air Resources Engineer, Stationary Source Division at (916) 323-0440 or by email at rhill@arb.ca.gov .

Further, the agency representative and designated back-up contact persons to whom nonsubstantive inquiries concerning the proposed administrative action may be directed are Artavia Edwards, Manager, Board Administration & Regulatory Coordination Unit, (916) 322-6070, or Alexa Malik, Regulations Coordinator, (916) 322-4011. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

If you are a person with a disability and desire to obtain this document in an alternative format, please contact the ARB's Clerk of the Board at (916) 322-5594 or sdorais@arb.ca.gov as soon as possible. TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies and private persons and businesses in reasonable compliance with the proposed regulations are presented below.

Pursuant to Government Code section 11346.5(a)(5), the Executive Officer has determined that the proposed regulations will possibly impose a mandate on local agencies or school districts. The Executive Officer has further determined pursuant to Government Code section 11346.5(a)(6) that the proposed regulations will result in some additional costs to the Air Resources Board and other state agencies. In addition, the Executive Officer has also determined pursuant to Government Code section 11346.5(a)(6) that the proposed regulatory action will possibly create a cost to any local agency or school district that is required to be reimbursed under Part 7 (commencing with section 17500) of Division 4 of the Government Code or other nondiscretionary

costs or savings imposed on local agencies. The Executive Officer further determined that the proposed regulations will not result in costs or savings in federal funding to the state.

Fiscal Impact on Local Agencies or School Districts

The Executive Office has determined that the proposed regulatory action will have an impact, although insignificant, on costs to local agencies or school districts since it will include a mandate a very small number of local agency or school district owned TRUs. Some minor costs will occur for the few local agencies and school districts that own or operate TRUs. We believe that the reporting costs to local agencies and to school districts will be negligible since many will be exempt from the facility reporting requirements, and the estimated operator reporting cost will be minor. Some costs will also occur in 2008 to upgrade TRUs to comply with the requirements in the ATCM. The capital cost of installing equipment in 2008 to comply with the ATCM will be between $2,000 and $20,000 per TRU. However, the cost directly attributable to the ATCM is assumed only to range between $2,000 to $6,000, since most of the TRUs that will have to comply in 2008 will be at the end of their useful life and would be scheduled for replacement in any event. Statewide, the total number of TRUs owned or operated by local agencies and school districts are not known, but are expected to be very few. Thus, the cost impact to any local agency or school district should be very small.

Fiscal Impact on State Agencies or Federal Funding to the State

Some minor costs will occur for correctional facilities that own and operate TRUs. We believe that the reporting costs to correctional facilities will be negligible since many will be exempt from the facility reporting requirements, and the estimated operator reporting cost will be minor. Some costs will also occur in 2008 to upgrade TRUs they own to meet the requirements in the ATCM. The capital cost of installing equipment to comply with the ATCM in 2008 will be between $2,000 and $20,000 per TRU. However, the cost directly attributable to the ATCM is assumed only to range between $2,000 to $6,000 per TRU since most of the TRUs that will have to comply in 2008 will be at the end of their useful life and would be scheduled for replacement in any event. The Department of Corrections (Corrections) owns approximately 20 TRUs. We believe that capital costs for Corrections in 2008, that are attributable to the ATCM, is between $40,000 and $120,000. Since these costs are insignificant compared to their overall budget, we believe that the costs will be able to be met within the existing budget.

The proposed ATCM will impose a cost to the ARB for TRU enforcement, for records management, and for issuing ARB identification numbers to operators or owners of TRUs. Initial costs to the ARB primarily involve developing the TRU database for tracking in-use TRUs and facility operations throughout the state. Additional cost will result from enforcement activities through the ARB's existing Heavy-Duty Vehicle Inspection program performed at various weigh stations throughout California and at various food distribution or cold storage facilities. The ARB is expected to incur annual costs to implement the TRU ATCM starting in the 2005 FY, but anticipates that the costs will be absorb within their existing budgets.

The Executive Officer has also determined that the proposed regulatory action will not create costs or savings in federal funding to the State.

Fiscal Impact to Businesses

The Executive Officer has made an initial determination that the proposed regulatory action will not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

In developing this regulatory proposal, the ARB staff evaluated the potential economic impacts that representative private persons or businesses might incur in reasonable compliance with the proposed ATCM. The Executive Officer has initially assessed that the proposed regulatory action will affect the businesses that operate TRUs or have facilities that are frequented by TRUs. The costs for businesses and individuals that operate TRUs or TRU generator sets are estimated to be in the range of $101 to $168 million, over a 13-year period, which results in a cost-effectiveness between $10 and $20 per pound of diesel PM reduced.

In accordance with Government Code sections 11346.3 and 11346.5(a)(10), the Executive Officer has determined that the proposed regulatory action may lead to creation or elimination of some businesses, the creation of new businesses or elimination of existing businesses within the State of California, or the expansion of businesses currently doing business within the State of California. Due to the long lead-time for compliance, wide range of compliance options, and small business exemption, we believe that most businesses will be able to meet the compliance costs. However, it is possible that a small number of businesses (those with marginal profitability) may experience financial difficulty in complying with the regulation. Businesses that may be created include those that furnish, install, and maintain diesel emission control systems, as well as those that provide alternative compliance strategies. Engine manufacturers, TRU manufacturers, and TRU sales and service dealers are likely to see an increase in business due to accelerated attrition and other options to meet the in-use requirements of the regulation.

The Executive Officer has also determined, pursuant to title 1, CCR, section 4, that the proposed regulatory action will have some impact on small businesses. We believe that a significant proportion of the TRU owners and operators are likely to be small businesses because approximately 80 percent of the TRU owners own 20 or less TRUs. Small business will incur costs in 2008 to retrofit and replace engines. ARB estimates the cost to a typical small business (own three TRUs) to be $6,000 to $60,000 in 2008. Of this total cost, ARB believes that $2,400 to $24,000 is attributable to the ATCM.

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the ARB's Executive Officer has found that the reporting requirements of the regulation that apply to businesses are necessary for the health, safety, and welfare of the people of the State of California.

In accordance with H&SC 43013(c), the Executive Officer has determined that the standards and other requirements in the proposed ATCM are necessary, cost-effective, and technologically feasible for agricultural operations (i.e., farm equipment).

A detailed assessment of the economic impacts of the proposed regulation can be found in the ISOR.

Consideration of Alternatives

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the agency or that has otherwise been identified and brought to the attention of the agency would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action

SUBMITTAL OF COMMENTS

The public may present comments relating to this matter orally or in writing at the hearing, and in writing or by e-mail before the hearing. To be considered by the Board, written submissions must be received **no later than 12:00 noon, December 10, 2003,** and addressed to the following:

Postal mail is to be sent to:

Clerk of the Board
Air Resources Board
1001 "I" Street, 23rd Floor
Sacramento, California 95814

Electronic mail is to be sent to: trude03@listserv.arb.ca.gov and received at the ARB **no later than 12:00 noon, December 10, 2003.**

Facsimile submissions are to be transmitted to the Clerk of the Board at (916) 322-3928 and received at the ARB **no later than 12:00 noon, December 10, 2003.**

The Board requests but does not require 30 copies of any written submission. Also the ARB requests that written, facsimile, and e-mail statements be filed at least 10 days prior to the hearing so that ARB staff and Board Members have time to fully consider each comment. The ARB encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

STATUTORY AUTHORITY

This regulatory action is proposed under the authority granted to the ARB in the California Health and Safety Code sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 43013, and 43018. This action is proposed to implement, interpret, or

make specific, Health and Safety Code sections 39618, 39650, 39658, 39659, 39666, 39667, 40717.9, 43013, and 43018.

HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, Title 2, Division 3, Part 1, Chapter 3.5 (commencing with section 11340) of the Government Code.

Following the public hearing, the ARB may adopt the regulatory language as originally proposed or with non-substantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the modifications are sufficiently related to the originally proposed text that the public was adequately placed on notice that the regulatory language as modified could result from the proposed regulatory action. In the event that such modifications are made, the full regulatory text, with the modifications clearly indicated, will be made available to the public for written comment at least 15 days before it is adopted.

The public may request a copy of the modified regulatory text from the ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, California 95814, (916) 322-2990.

CALIFORNIA AIR RESOURCES BOARD

Michael N. Schuble

for Catherine Witherspoon
Executive Officer

Date: October 14, 2003

"The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our Web-site at www.arb.ca.gov."

State of California
California Environmental Protection Agency
AIR RESOURCES BOARD

ERRATA

STAFF REPORT: INITIAL STATEMENT OF REASONS (ISOR) FOR PROPOSED RULEMAKING

AIRBORNE TOXIC CONTROL MEASURE FOR IN-USE DIESEL-FUELED TRANSPORT REFRIGERATION UNITS (TRU) AND TRU GENERATOR SETS, AND FACILITIES WHERE TRUs OPERATE

Public Hearing Date: December 11, 2003
Initial Date of Release of ISOR: October 24, 2003
Release date of Errata and Revised ISOR: October 28, 2003

This errata corrects several incorrect references in the ISOR that was initially released on October 24, 2003, correctly paginates the document so that the pagination corresponds to the Table of Contents, and corrects several punctuation and spelling errors. A summary of the corrected references follows. The balance of the revised ISOR is otherwise substantively the same as that which was released on October 24, 2003.

The revised ISOR replaces the version posted to the Air Resources Board's rulemaking WebPages on October 24, 2003.

Errata

Executive Summary, page E-14, first sentence: the reference to "10 years" has been changed to "12 years."

Chapter II, page II-2, top paragraph: the reference to "U.S. EPA has been changed to "United States Environmental Protection Agency (U.S. EPA)".

Chapter V, page V-13, 2nd paragraph, 4th sentence: the reference to "Figure VII-1" has been changed to "Figure VII-2".

Chapter V, page V-13, Figure V-3: the reference to "2010 (0.05 g/bhp-hr)" has been changed to "2020 (0.05 g/bhp-hr)"

Chapter, VIII, page VIII-2, Table VIII-1, footnote 4: the reference to "section C.2.3" has been changed to "section C.2.2".

Chapter, VIII, page VIII-3, Table VIII-2, footnote 4: the reference to "section C.2.3" has been changed to "section C.2.2".

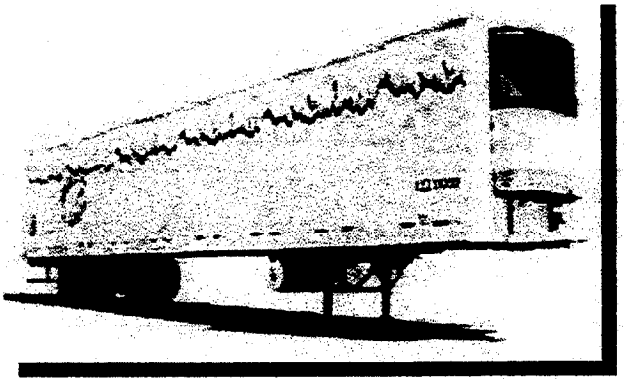
Chapter, VIII, page VIII-4, Table VIII-3, footnote 4: the reference to "section C.2.3" has been changed to "section C.2.2".

California Environmental Protection Agency

AIR RESOURCES BOARD

REVISED

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING



AIRBORNE TOXIC CONTROL MEASURE FOR IN-USE DIESEL-FUELED TRANSPORT REFRIGERATION UNITS (TRU) AND TRU GENERATOR SETS, AND FACILITIES WHERE TRUs OPERATE

Stationary Source Division
Emissions Assessment Branch

October 28, 2003

State of California
AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

Public Hearing to Consider

ADOPTION OF THE PROPOSED AIRBORNE TOXIC CONTROL MEASURE FOR IN-USE DIESEL-FUELED TRANSPORT REFRIGERATION UNITS (TRU) AND TRU GENERATOR SETS, AND FACILITIES WHERE TRUs OPERATE

To be considered by the Air Resources Board on December 11, 2003, at:

California Environmental Protection Agency
Headquarters Building
1001 "I" Street
Central Valley Auditorium
Sacramento, California

Stationary Source Division:
Peter D. Venturini, Chief
Robert D. Barham, Assistant Chief
Emission Assessment Branch:
Dan Donohoue, Chief
Process Evaluation Section:
Tony Andreoni, Manager

This report has been prepared by the staff of the Air Resources Board. Publication does not signify that the contents reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

State of California
AIR RESOURCES BOARD

PROPOSED AIRBORNE TOXIC CONTROL MEASURE FOR IN-USE DIESEL-FUELED TRANSPORT REFRIGERATION UNITS (TRU) AND TRU GENERATOR SETS, AND FACILITIES WHERE TRUs OPERATE

Executive Summary and
Technical Support Document

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U.S. Environmental Protection Agency

Staff Report: Initial Statement of Reasons for the Proposed Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRU) and TRU Generator Sets, and Facilities where TRUs Operate

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State of California
AIR RESOURCES BOARD

Staff Report: Initial Statement of Reasons for the Proposed Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRU) and TRU Generator Sets, and Facilities where TRUs Operate

EXECUTIVE SUMMARY

This executive summary presents the Air Resources Board (ARB or Board) staff's *Proposed Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRUs) and TRU Generator Sets, and Facilities where TRUs operate*. The proposed airborne toxic control measure (ATCM) is designed to reduce diesel particulate matter (diesel PM) emissions and resulting exposure from in-use TRUs and TRU generator sets which are powered by diesel engines and used to refrigerate temperature-sensitive products that are transported in insulated semi-trailer vans, truck vans, shipping containers, and rail cars.

The ARB, in addition to maintaining long-standing efforts to reduce emissions of ozone precursors, is now challenged to reduce emissions of diesel PM. In 1998, the Board identified diesel PM as a toxic air contaminant (TAC). Because of the amount of emissions to California's air and its potency, diesel PM is the number one contributor to the adverse health impacts of TACs known today.

Diesel exhaust is a complex mixture of thousands of gases and fine particles that contains more than 40 identified TACs. These include many known or suspected cancer-causing substances, such as benzene, arsenic and formaldehyde. In addition to increasing the risk of lung cancer, exposure to diesel exhaust can have other health effects as well. Furthermore, diesel exhaust can irritate the eyes, nose, throat and lungs, and it can cause coughs, headaches, light-headedness and nausea. Diesel exhaust is a major source of fine particulate pollution as well and numerous studies have linked elevated particle levels in the air to increased hospital admissions, emergency room visits, asthma attacks and premature deaths among those suffering from respiratory problems.

To reduce public exposure to diesel PM, the Board approved the *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles* (Diesel Risk Reduction Plan) in 2000. This comprehensive plan outlined steps to reduce diesel emissions from both new and existing diesel-fueled engines and vehicles. The goal of the Diesel Risk Reduction Plan is to reduce diesel PM emissions and associated potential cancer risks by 75 percent in 2010 and by 85 percent by 2020.

ARB staff is proposing this ATCM to reduce diesel PM emissions from TRU and TRU generator set diesel-fueled compression ignition engines. The proposed ATCM is one

of many ATCMs that are being considered by the ARB to fulfill the goals of the Diesel Risk Reduction Plan. The ATCMs scheduled for Board consideration in the last quarter of 2003 and the first quarter of 2004 include measures to reduce emissions from residential and commercial solid waste collection vehicles, fuel cargo delivery trucks, stationary diesel-fueled engines, and portable engines.

Presented below is an overview which briefly discusses the emissions from new and existing TRU and TRU generator set engines, the proposed ATCM and its potential impacts from implementation, as well as plans for future activities. For simplicity, the discussion is presented in question-and-answer format using commonly asked questions about the ATCM. It should be noted that this summary provides only a brief discussion on these topics. The reader is directed to subsequent chapters in the main body of the report for more detailed information. Also, unless otherwise noted herein, all references to TRUs include TRU generator sets.

1. What are Transport Refrigeration Units and Generator sets?

A Transport Refrigeration Unit (TRU) is a refrigeration system powered by a diesel engine designed to refrigerate temperature-sensitive products that are transported in insulated semi-trailer vans, truck vans, shipping containers, and rail cars. The diesel engine is generally between 7 and 36 horsepower (hp) with the most common size being about 35 hp. TRUs include refrigeration systems where the diesel engine is directly connected to the refrigeration unit and refrigeration systems where a generator is powered by a diesel engine to provide electrical power to the refrigeration unit (TRU generator set).

2. What are the emissions, exposure, and risk due to TRU diesel engines?

There are currently about 31,000 TRUs and TRU generator sets based in California, another 7,500 out-of-state refrigerated trailers, and 1,700 railcar TRUs operating in California at any given time. The estimated emissions from TRU engines and TRU generator sets operating in California are shown in Table E-1. As shown, we estimate diesel PM emissions from TRUs and TRU generator sets to be almost two tons per day or 2.6 percent of the total statewide diesel PM emissions (base year 2000). Estimated oxides of nitrogen (NOx) emissions are higher at about 20 tons per day (less than one percent of the statewide inventory). Without additional regulations to reduce emissions, we anticipate that both diesel PM and NOx emissions from TRUs will grow in future years. Based on our emissions projections, the diesel PM emissions from TRUs will increase to almost 2.5 tons per day in 2010 and increase again to over three tons per day in 2020. The projected 2010 and 2020 emission estimates do not include projected emission reductions from the proposed United States Environmental Protection Agency (U.S. EPA) Tier 4 engine standards, and do not include emission reductions due to the proposed ATCM.

Table E-1: Estimated Statewide Emissions from TRUs and TRU Generator Sets

Emission Year	Total Emissions in Tons per Day (Percent of Total Statewide Diesel Emissions)*	
	PM	NOx
2000	2.0 (2.6%)	19.6
2010	2.5 (4.0%)	24.9
2020	3.1 (6.0%)	38.2

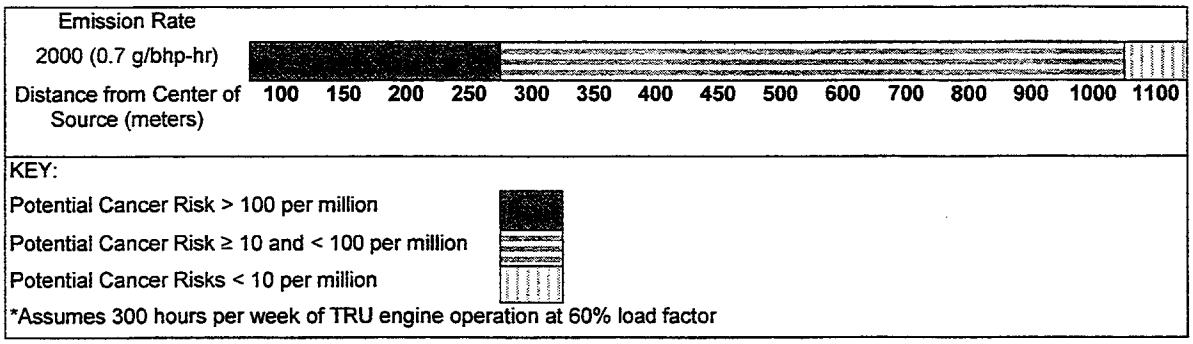
* The number in the parenthesis is the percent of the total statewide diesel PM emissions attributed to TRUs based on the October 2000 Diesel Risk Reduction Plan

The highest concentrations of diesel PM from TRUs are expected to occur at locations where numerous TRUs operate (i.e. distribution facilities, ports, and intermodal facilities). The diesel PM concentrations are dependent on the size (hp) of the engine, the age of the engine (emission rate depends on model year of engine), the number of hours of operation (run time) of the TRU engine at a facility, the distance to the nearest receptor, and meteorological conditions at the site.

Because a diesel PM monitoring technique is not currently available, diesel PM concentrations at locations where numerous TRUs operate were estimated using computer modeling techniques. To estimate exposure and the associated cancer risk near facilities where TRUs operate, staff used reasonable assumptions encompassing a fairly broad range of possible operating conditions for TRU engines. Based upon the assumptions and conditions evaluated, the results showed that facilities where numerous TRUs operate could potentially result in significant health risk to individuals living near the facilities.

To illustrate the potential near-source cancer risk, staff performed a risk assessment analysis on a generic (i.e., example) facility assuming a total on-site operating time for all TRUs of 300 hours per week. As shown in Figure E-1 below, at this estimated level of activity and assuming a current fleet diesel PM emission rate of 0.7 g/bhp-hr, staff estimates the potential cancer risk would be over 100 in a million at 250 meters (800 feet) from the center of the TRU activity. The estimated potential cancer risk would be in the 10 to 100 per million range between 250 and 1,000 meters (800 to 3,300 feet) and fall off to less than 10 per million at approximately 1,100 meters (3,600 feet). These risk values assume an exposure duration of 70 years for a nearby resident and uses the methodology specified in the latest (2003) OEHHA health risk assessment guidelines.

Figure E-1
Estimated Risk Range Versus Distance from Center of TRU Activity Area – Year 2000



3. What does the proposed TRU ATCM require?

The proposed ATCM would require in-use TRU engines that operate in California, including out-of-state TRUs while they are operating in California, to meet specific performance standards that vary by horsepower range. The in-use performance standards have two levels of stringency that would be phased-in over time. The first phase, beginning in 2008, is referred to as the low emission TRU performance standards. The second phase, beginning in 2010, is referred to as the ultra-low emission TRU performance standards. The proposed TRU performance standards are shown in Table E-2 below.

Table E-2
Proposed TRU and TRU Generator Set Performance Standards

Horsepower Category	PM Emissions Standard (grams/horsepower-hour)	Options for Meeting Performance Standard
Low Emission Performance Standards		
<25	0.30 g/hp-hr	▪ Level 2 or better verified control strategy (51 to 85% PM reduction) ▪ Alternative technologies
≥ 25	0.22 g/hp-hr	▪ Level 2 or better verified control strategy (51 to 85% PM reduction) ▪ Alternative technologies
Ultra-Low Emission Performance Standard		
<25	N/A	▪ Level 2 or better verified control strategy (51 to 85% PM reduction) ▪ Alternative technologies
≥ 25	0.02 g/hp-hr	▪ Level 3 verified control strategy (at least 85% PM reduction) ▪ Alternative technologies

The proposed ATCM would require owners of TRUs to meet more stringent performance standards at seven-year intervals until the TRU meets the ultra-low emission TRU performance standards. The phased in compliance schedule for various model engine years is shown below in Table E-3. For example, by December 31, 2008, all TRUs operating in the state with model year 2001 and older diesel engines will have to meet the low emission TRU performance standards. Any TRUs equipped with 2001 or older engines that are still in use in 2015 (2008 plus seven years) will have to meet the ultra-low TRU performance standards by December 31, 2015. TRUs equipped with 2002 model year diesel engines will have to meet the low emission TRU performance standard by December 31, 2009. Any TRUs equipped with a 2002 model year engine that is still in use in 2016 (2009 plus seven years) will have to meet the ultra-low TRU performance standards by December 31, 2016. TRUs equipped with 2003 model year diesel engines will have to meet the ultra-low emission performance standards by December 31, 2010. As shown in Table E-2 above, the low emission TRU performance standards can be met by either buying a new engine that meets the PM emission standard, retrofitting the existing engine with a level 2 (PM reduction of 51 to 85%) or better control system, or switching to an alternative technology.

Table E-3
Proposed TRU and TRU Generator Set Compliance Schedule

Model Year of Engine	Compliance Date for Low Emission Standard	Compliance Date for Ultra-Low Emission Standard
2001 or older	2008	2015*
2002	2009	2016*
2003	N/A	2010
Future years	N/A	Model year + 7

* Early compliance of low emission standard for model year 2002 or older may extend compliance date for ultra-low emission standard by up to three years

The average useful life of a TRU is 10 years. The proposed ATCM in effect reduces the useful life of in-use TRUs to seven years. This accelerated upgrade or replacement of TRUs will ensure that the majority of the TRU fleet will be comprised of ultra-low emission TRUs by 2020.

The proposed ATCM also contains two reporting provisions. Owners of TRUs operating in California would be required to submit an initial report to ARB that provides information about the TRUs they operate in California. Updates would need to be provided as TRUs are leased, purchased, or sold. The information is needed to assist in the implementation of the ATCM. The second reporting provision applies to large facilities where TRUs operate. Facilities with 20 or more doors serving a refrigerated storage area would be required to submit a one-time report to ARB. This information is needed to evaluate the overall effectiveness of the regulation in reducing diesel PM concentrations near facilities where numerous TRUs operate.

4. What businesses will be affected by the proposed ATCM?

The "in-use" requirements of the proposed ATCM would affect owners and operators of diesel-fueled TRUs that operate in California whether the TRUs are registered in the State or outside the State. This would include all carriers that transport perishable goods using refrigerated trucks, trailers, shipping containers, and railcars that come into California. There are a few local municipalities, school districts, and correctional institutions that operate TRUs that may be affected. Larger facilities where TRUs operate would also be affected.

5. What early reduction incentives are built into the ATCM?

The proposed ATCM includes provisions that encourage operators of 2002 and older model year TRU engines and TRU generator set engines to comply early with the low emission TRU performance standards by offering a delay in the ultra-low emission TRU compliance date. Staff is proposing that for each year of early compliance with the low emission TRU performance standards, a company can extend the compliance date with the ultra-low emissions TRU by one year, up to a maximum of three years. For example, if a 2002 model year TRU engine complies with the low emission TRU performance standards in 2006 (2006 is three years early since December 31, 2009 would be the actual compliance date for a model year 2002 engine), by using a verified control system, an operator does not have to comply with the ultra-low TRU performance standards until 2019. This provision is only available for 2002 and older engines. This early reduction incentive should provide a significant reduction in diesel PM sooner than the 2008 implementation date, thus greatly reducing the total statewide PM and the health risks at facilities.

6. What emission control strategies potentially could be used on TRU engines?

A variety of diesel emission control strategies could potentially be used for controlling emissions from these diesel engines, including "add-on" exhaust aftertreatment systems, fuel strategies, fuel additives, and engine modifications. Aftertreatment systems could be add-on technologies such as diesel particulate filters (DPF), flow-through-filters (FTF) and diesel oxidation catalysts (DOC). Fuel strategies include alternative fuels, alternative diesel fuels, and fuel additives. Alternative fuels include, but are not limited to, compressed natural gas (CNG), and liquefied petroleum gas (LPG). Dual-fuel pilot-ignition CNG or LPG fumigation engines are promising alternative fuel engine approaches. Alternative diesel fuels include, but are not limited to, water emulsion diesel fuels, biodiesel, and Fischer-Tropsch fuels. An example of a fuel additive is a fuel borne catalyst. These technologies can be combined to form additional diesel emission control strategies. In addition, repowering with a new, cleaner diesel engine is a possible strategy. Electric standby, cryogenic temperature control systems, and fuel cells are also possible diesel emission control strategies that could eliminate diesel emissions at facilities where TRUs operate.

Currently, there are no "verified" diesel emissions control strategies for TRU engines. A "verified" diesel emissions control strategy refers to an emission control system that has been evaluated by ARB for its emissions reduction capabilities and durability under the ARB's *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emission from Diesel Engines*[1] (Verification Procedure). Staff believes that verified retrofit control systems for TRUs will become available over the next few years. Emission control technology manufacturers have indicated they are close to applying for verification of several diesel emissions control strategies under the Verification Procedure. These include fuel borne catalysts (FBC), FBC with ultra-low sulfur diesel fuel and a catalyzed wire mesh filter, and PuriNox™. In addition, staff believes that new TRUs equipped with engines that meet the more stringent off-road standards will likely replace many older TRUs. ARB staff anticipates that new engines meeting the Tier 4 nonroad standard should be available sooner than 2008.

Alternative technologies such as electric standby, cryogenic refrigeration, CNG, LPG, LNG, and gasoline-powered engines are currently feasible and would not require verification[2].

7. Is staff proposing any review to ensure that the engine and retrofit technologies for requirements with future effective dates are achievable?

Yes. Staff is proposing that two technology reviews be conducted to assure reliable, cost-effective compliance options are available in time for implementation. The first technology review would be in late 2007, a year prior to the first in-use compliance date for the first level of in-use performance standard compliance. At this time, staff would thoroughly evaluate progress made toward applying advanced technologies to meet the in-use performance standards required by the end of 2008 for TRU engines in the proposed TRU ATCM. The second technology review would be in 2009 and would evaluate whether verified emission control technology is available and cost-effective for a broad spectrum of TRUs to meet the more stringent level of in-use performance standards that would go into effect by the end of 2010 and beyond.

8. How will compliance be verified and control measure effectiveness be monitored?

Staff is proposing a registration program that uses an ARB identification (I.D.) numbering system. The I.D. numbers would include codes that indicate key compliance information such as model year of engine. California-based TRUs would be required to have I.D. numbers. For out-of-state operators, obtaining an ARB I.D. number would be voluntary. However, without such a coding system, an inspector would have to physically open up the TRU compartment to verify that the unit contains a complying engine or retrofit system. This could result in significant downtime for the truck. The

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[1] Approved by the Board in May 2002. Sections 2700 through 2710, Title 13, California Code of Regulations.

[2] Spark-ignited engines are regulated under the Off-road Large Spark-Ignition Engines 25 Horsepower and Greater regulation.

coding allows a quick inspection so that trucks can get back on the road as quickly as possible. Given this situation, we anticipate that most owners of out-of-state TRUs will obtain ARB I.D. numbers for their TRUs that operate in California.

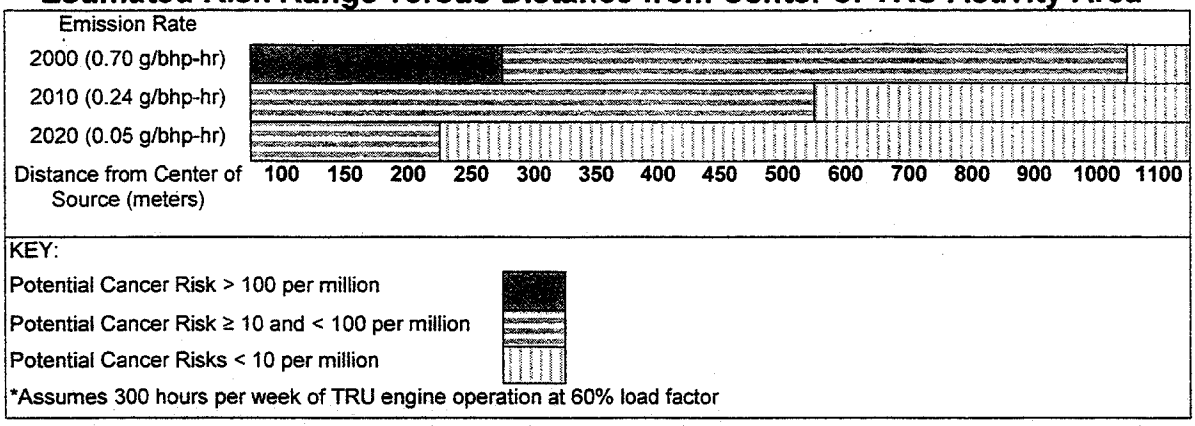
The proposed control measure would be enforced by ARB's Enforcement Division through roadside inspections conducted in conjunction with the Heavy Duty Vehicle Inspection Program. In addition, ARB inspectors would conduct audits at TRU operator terminals. As mentioned in question and answer number three, the proposed ATCM has reporting provisions that will assist ARB staff in monitoring the implementation of the ATCM and provide more accurate estimates of emission reductions.

9. What are the environmental impacts of the proposed ATCM?

The proposed ATCM will reduce diesel PM emissions and resulting exposures from TRUs operating throughout California. Staff estimated that the proposed ATCM, in conjunction with the proposed U.S. EPA Tier 4 nonroad engine standards for new engines, will reduce diesel PM emission factors by about 65 percent in 2010 and by about 92 percent in 2020. The potential total tons of diesel PM reduced by the implementation of the proposed ATCM and the U.S. EPA Tier 4 new nonroad engine standards are estimated to be approximately 3,000 tons by 2020, counting all implementation years. We also expect non-methane hydrocarbon emissions to be reduced by about 30 percent. Staff does not anticipate significant NOx reductions from this ATCM. However, some NOx reductions will result from accelerated turnover of the older fleet, or if diesel/LPG (dual fuel) TRU engines become a significant portion of the fleet. The dual fuel system can offer NOx reductions of up to 50 percent compared to a conventional diesel engine.

Reduction of potential cancer risk levels at locations where TRUs operate will result from the reduction in diesel PM emissions. Figure E-2, below, compares the cancer risk range at various distances assuming 300 hours of TRU engine run time per week. For year 2000, the current fleet average emission rate of 0.7 g/bhp-hr was used. The average fleet emission rate is assumed to be 0.24 g/bhp-hr in 2010 and 0.05 g/bhp-hr in 2020. These emission rates assume compliance with the ATCM and the proposed U.S. EPA Tier 4. Figure E-2 below also shows that the estimated near source risk is significantly reduced (by approximately 92 percent) as the diesel PM emission rate is reduced from the current fleet emission rate to the much lower emission rate in 2020.

Figure E-2
Estimated Risk Range versus Distance from Center of TRU Activity Area*



We anticipate significant health cost savings due to reduced mortality, incidences of cancer, PM related cardiovascular effects, chronic bronchitis, asthma, and hospital admissions for pneumonia and asthma-related conditions. These directly emitted diesel PM reductions are expected to reduce the number of premature deaths in California. ARB staff estimates that 211 premature deaths will be avoided by year 2020. Prior to 2020, cumulatively, it is estimated that 31 premature deaths would be avoided by 2010 and 129 by 2015. Additional health benefits are expected from the reduction of NOx emissions, which give rise to secondary PM from the conversion of NOx to PM2.5 nitrate. ARB staff has concluded that no significant adverse environmental impacts should occur under the proposed ATCM.

10 What are the estimated economic impacts of the proposed ATCM?

The economic impact of the TRU ATCM will vary depending on the compliance approach selected. Assuming that verified retrofit control devices are available to meet both the low emission and ultra-low emission performance standards in the ATCM, the estimated annual cost of the ATCM would range from $4.8 to $9 million per year between 2008 and to 2020. The estimated total cost for the retrofit compliance approach would be $87 million to $156 million (in 2002 dollars) for the 13-year compliance period. The cost to an individual choosing the retrofit control option is estimated to be between $2,000 and $2,300 per TRU. Operation and maintenance costs would add an additional $100 to $300 per year.

In the event that verified retrofit devices are not available, staff estimates that a strategy relying on new engine replacement or TRU replacement will result in annual costs of $4 to $9 million per year, and total cost ranging from $89 million to $156 million for the 13 year compliance period. These costs do not represent the total cost of engine/TRU replacement, but have been adjusted to take into consideration that many of the engines are approaching the end of their useful life of 10 years. Staff assumed that the ATCM was responsible for 40 percent of the engine replacement cost for TRUs 10 years old and newer, and 15 percent of the TRU replacement cost for TRUs that are 11

years and older. The cost to an individual purchasing a new engine for compliance is estimated to be $4,000 to $5,000 per unit. The cost to an individual purchasing a new TRU is estimated to be $10,000 to $20,000 depending on whether the TRU unit is for a straight truck or trailer. Both the new engine and TRU replacement option costs do not have any associated increase in operating costs.

We estimate the overall cost effectiveness of the proposed ATCM to be between $10 and $20 per pound ($/lb) of diesel PM reduced, considering only the benefits of reducing diesel PM. Additional benefits are likely to occur due to the reduction in reactive organic gases (ROG) and NOx emissions.

With regard to mortality benefits, we estimate the cost of avoiding one premature death to range between $282,000 to $564,000 (in 2002 dollars) based on attributing the cost of controls to reduce diesel PM. Compared to the U.S. EPA's established $6.3 million (in year 2000 dollars) for a 1990 income level as the mean value of avoiding one death (U.S. EPA 2003), this proposed ATCM is a very cost-effective mechanism to reduce premature deaths that would otherwise be caused by diesel PM emissions without this regulation. The cost range per death avoided because of this proposed regulation is 8 to 22 times lower than the U.S. EPA's benchmark for value of avoided death.

No significant economic impacts to school districts, local public agencies, state agencies, and federal agencies are expected, due to the low number of TRUs operated by them and their relatively few number of facilities that would be subject to this ATCM. Costs to ARB for initial outreach, educational efforts, and enforcement would be absorbed within existing budgets.

This regulation may lead to creation or elimination of businesses. Due to the long lead time for compliance, wide range of compliance options, and small business facility reporting exemption (facilities with less than 20 refrigerated doors), we believe that most businesses will be able to meet the compliance costs. However, it is possible that a small number of businesses (those with marginal profitability) may experience financial difficulty in complying with the regulation. Businesses that may be created include those that furnish, install, and maintain diesel emission control systems, as well as those that provide alternative compliance strategies. Engine manufacturers, TRU manufacturers, and TRU sales and service dealers are likely to see an increase in business due to accelerated attrition and other options to meet the in-use requirements of the regulation.

11. How will the proposed ATCM affect the State Implementation Plan (SIP)?

The ARB's *Proposed 2003 State and Federal Strategy for the California State Implementation Plan* (Proposed Strategy) describes defined state and federal measures that will reduce emissions and improve air quality statewide. Because this ATCM was still under development when the Proposed Strategy was released, it was not possible to project the expected ancillary reactive organic gas (ROG) emission reductions that would result from its implementation. However, once the TRU ATCM is adopted and

the emission reductions are enforceable, ARB may claim any associated ROG benefits against our SIP commitments. The proposed TRU ATCM would reduce ROG emissions, which in turn would help decrease ambient ozone levels, thereby helping the South Coast air basin attain the federal ozone standard. In addition, reductions of direct diesel particulate will help decrease ambient particulate levels and make progress toward attainment of federal particulate matter standards in the South Coast and the San Joaquin Valley.

12. What actions did staff take to consult with interested parties?

Staff made extensive efforts to ensure that the public and affected parties were aware of, and had opportunity to participate in, the rule development process. Staff contacted major TRU and TRU generator set manufacturers, engine manufacturers, emission control system manufacturers, operators, and operator organizations both to alert affected industry and to gather information about the technology and operation of the equipment. The data and information collected from these sources was supplemented by approximately 25 facility tours and facility operator interviews. Staff also contacted State and local agencies that have involvement with TRU operators and the facilities where TRUs operate, informed them of the development of the ATCM, and requested information and data.

Staff discussed numerous regulatory approaches for controlling TRU and TRU generator set emissions with affected industry and the public during a public consultation meeting, nine workgroup meetings/conference calls, five public workshops, and a large number of stakeholder meetings, e-mails, and telephone conversations. Staff also conducted outreach with the agricultural community, grocers associations, trucking associations, cold storage warehouse associations, port terminal associations, and railroad associations. In addition, ARB's efforts to reduce diesel PM emissions, including TRU's, has also been discussed at several communities meetings as part of our Community Health Program. Information on our efforts was provided on April 1, 2003, at the Boyle Heights community meeting on air pollution, and on April 30, 2003 at the Wilmington community meeting.

Staff tracked available and emerging emission control methods and facilitated communication among control system manufacturers and TRU and TRU generator set manufacturers, engine manufacturers, and operators. This continuing effort has resulted in a number of demonstration projects and studies that have provided important information regarding the feasibility and efficacy of various PM control devices, retrofit technology, electrification, and alternative fuel use.

13. How does the proposed ATCM relate to ARB's goals on Environmental Justice?

The proposed ATCM is consistent with the ARB's Environmental Justice (EJ) Policy to reduce health risks from TACs in all communities, including low-income and minority communities. Many communities are located near where TRUs operate, such as heavily

traveled freeways, storage and distribution facilities, railyards, and ports. By reducing emissions of diesel PM, other known TACs, and other air pollutants from TRUs and TRU gen sets, the proposed ATCM will provide air quality benefits by reducing exposure to and associated health risk from these pollutants near facilities where TRUs and TRU generator sets operate.

14. What other laws establish requirements for TRU engine emissions in California?

The U.S. EPA and ARB regulate TRU engines as mobile nonroad (off-road) engines. TRU engines less than 25 horsepower (<25 hp) became subject to U.S. EPA and ARB emission standards in 1995. Engines in the greater than or equal to 25 horsepower (≥25 hp) to less than 50 horsepower (< 50 hp) became subject to U.S. EPA and ARB emission standards in 1999. In April of 2003, U.S. EPA proposed new emission standards for engines in both of these horsepower categories. These new standards are referred to as the Tier 4 nonroad standards. The proposed effective date for the Tier 4 standards for <25 hp engines is 2008.

The proposed effective dates for the Tier 4 standards for engines in the ≥25 hp to <75 hp category are an "interim" standard in 2008 and a "long term" standard in 2013. The "long term" standard must be implemented in 2012 if the engine manufacturer elected not to meet the "interim" standard. Staff expects that the manufacturers of TRU engines will meet the "interim" 2008 standards. As soon as the U.S. EPA Tier 4 standards are adopted, ARB plans to adopt new engine standards that harmonize with the federal standards. Below are the existing and proposed PM emission standards (Figures E-3 and E-4) for the TRU engine horsepower categories based on the model year of the engine.

Figure E-3: PM Emission Standards for TRUs < 25 hp

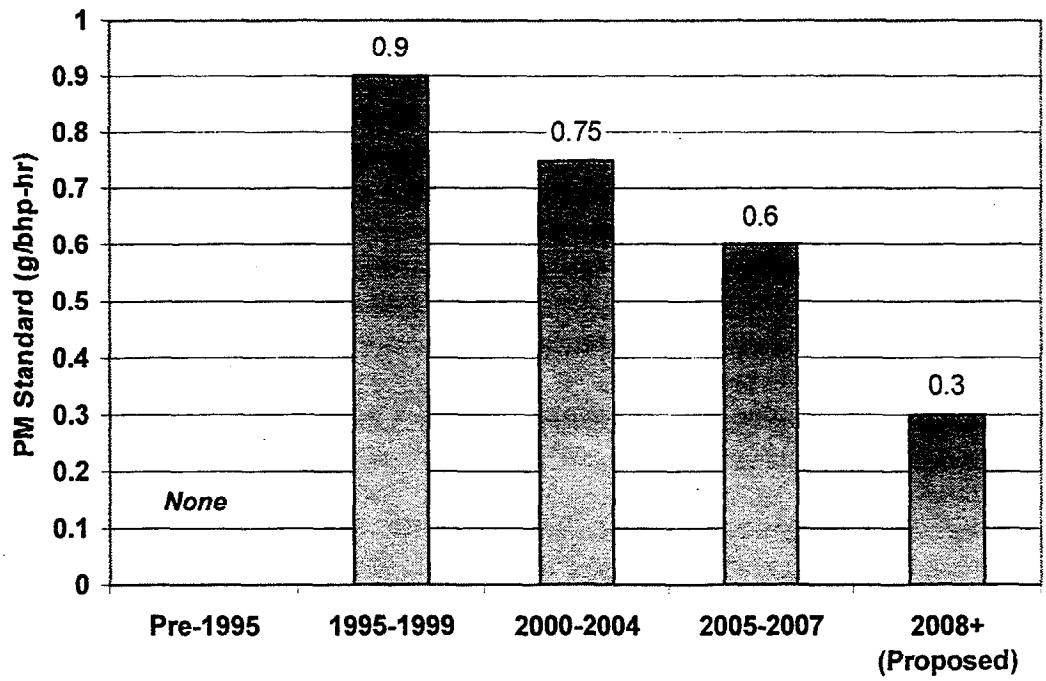
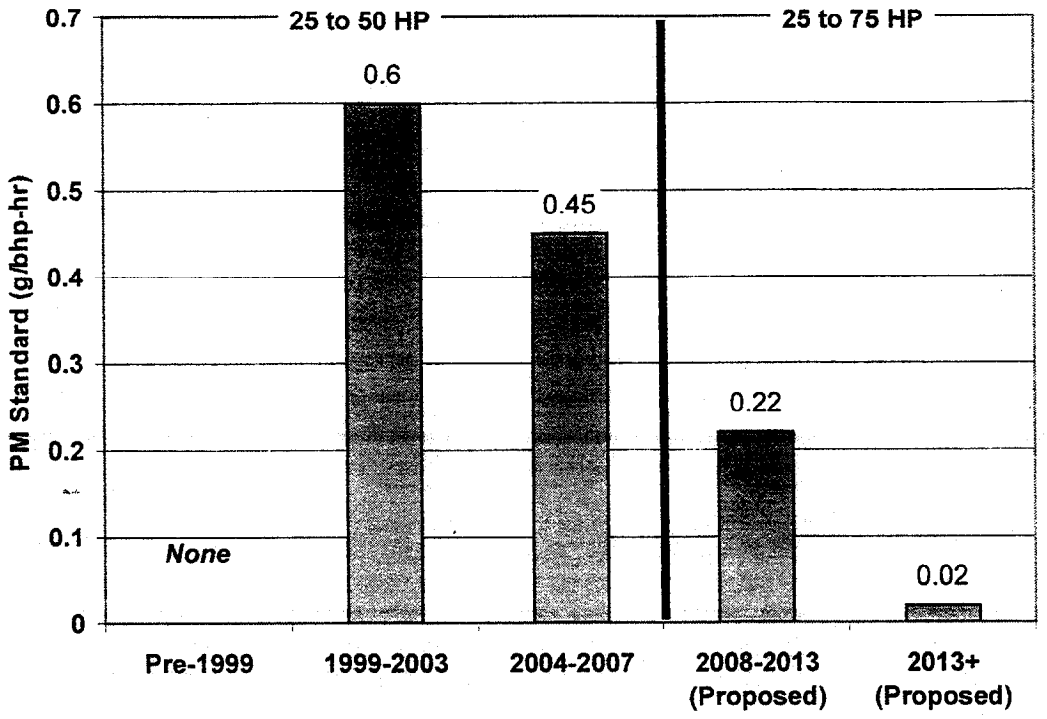


Figure E-4: PM Emission Standards for TRUs ≥ 25 HP



15. What future activities are planned?

In addition to activities associated with monitoring and implementing the proposed regulation, staff has recognized the need to continue collecting information about TRU operations, facility operations, and evaluating residual risk at facilities. Some of these activities include:

- Seek a Title I section 209(e) waiver from U.S. EPA.
- Work with affected business to develop outreach and training opportunities to assist operators and facilities in complying with the ATCM
- Development of TRU identification number issuing systems and database
- Conduct emission control technology reviews in 2007 and 2009
- Work with the U.S. EPA to propose long-term PM emission standard for less than 25 hp engines
- Conduct an analysis of the large facility data submitted in 2005.

16. What is staff's recommendation?

ARB staff recommends the Board adopt section 2022, Title 13, chapter 3, article 4, CCR, in its entirety. The regulation is set forth in the proposed regulation order in Appendix A.

In addition, staff recommends that the Board direct staff to conduct two technology reviews. The first, in 2007, would evaluate technology readiness for the in-use

requirements that would begin to be phased in by the end of 2008 and continue phase-in over the next 12 years. Part of that technology evaluation would be to determine if more stringent standards for these pollutants would be feasible for <25 hp TRU engines in the 2010 to 2013 time-frame. In addition, ARB proposes a second technology review to be conducted in 2009 to evaluate whether technologies that would meet the ultra-low emission TRU performance standards would be available and cost-effective for a broad spectrum of the model year 2003 through 2005 TRU and TRU gen set engines that would need to come into compliance by the end of 2010 through 2012, respectively.

REFERENCES:

U.S. EPA, 2003. Control of Emissions of Air Pollutants from Nonroad Diesel Engines and Fuel, Proposed Rule Making Notice of Proposed Rule Making, Federal Register. Vol. 68 No. 100, May 23, 2003, pp. 28327-28603. U.S. Environmental Protection Agency.

State of California
AIR RESOURCES BOARD

Staff Report: Initial Statement of Reasons for the Proposed Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRU) and TRU Generator Sets, and Facilities Where TRUs Operate

Technical Support Document

I. INTRODUCTION

A. Overview

The California Air Resources Board's (ARB or Board) mission is to protect public health, welfare, and ecological resources through the effective and efficient reduction of air pollutants, while recognizing and considering the effects on the economy of the State. ARB's vision is that all individuals in California, especially children and the elderly, can live, work, and play in a healthful environment – free from harmful exposure to air pollution. Diesel engine exhaust, is a source of unhealthful air pollutants including: gaseous- and particulate-phase toxic air contaminants (TAC), particulate matter, carbon monoxide, hydrocarbons, and oxides of nitrogen. Diesel-fueled Transport Refrigeration Units (TRU) and TRU generator set engines emit diesel exhaust particulate matter (diesel PM), a TAC. Staff are proposing an Airborne Toxic Control Measure (ATCM) to reduce diesel PM emissions from in-use TRUs and TRU generator sets because exposure to diesel PM causes adverse health effects.

This Staff Report for the Proposed ATCM includes:

- Background regulatory information (Chapter I);
- Discussion of the need for control of diesel particulate matter (Chapter II);
- A summary of public outreach (Chapter III);
- Discussion of diesel TRUs and TRU generator sets (Chapter IV);
- Potential emissions, exposure, and risk from diesel TRUs (Chapter (V);
- Availability and technological feasibility of potential control measures (Chapter VI);
- A summary and discussion of the proposed ATCM, including alternative requirements considered (Chapter VII);
- Economic impacts of the proposed control measure (Chapter VIII);
- Environmental impact of the proposed control measure (Chapter IX);
- The proposed text of the measure and other supplementary information (Appendices).

B. Purpose

The proposed ATCM is designed to reduce the general public's exposure to diesel PM and other TACs from TRUs and TRU generator sets and thereby reduce near-source risk at facilities where TRUs congregate. The proposed ATCM would require TRUs that operate in California to meet in-use performance standards in a two-step process using a phased compliance schedule. Older TRUs and TRU generator sets would initially comply with the first-step performance standards which are referred to as Low-Emission TRU (LETRU). Compliance with the second step of in-use Performance standards, referred to as the Ultra-Low Emission TRU (ULETRU), would be required approximately seven years after the compliance date for the LETRU requirements. Units that use alternative technologies that eliminate diesel engine operation while at a facility would qualify as ULETRU-compliant. Owner/Operators would be required to submit a report to ARB and update the ARB if changes occur. Larger facilities (≥ 20 loading dock doors serving refrigerated areas) that are visited by TRUs and TRU generator sets (e.g. grocery distribution centers) would be required to report information to ARB that indicates the level of TRU activity at the facility. ARB would use the information to determine if the ATCM adequately addressed residual risk near these facilities. Chapter VII of this Staff Report contains a discussion of the proposed ATCM. Appendix A contains the full text of the proposed ATCM.

C. Regulatory Authority

Several sections of the California Health and Safety Code (HSC) provide the ARB with authority to adopt the proposed ATCM. HSC sections 39600 (General Powers) and 39601 (Standards, Definitions, Rules, and Measures) confer to the ARB, the general authority and obligation to adopt rules and measures necessary to execute the Board's powers and duties imposed by State law. HSC sections 43013(b) and 43018 provide broad authority for adopting measures to reduce TACs and other air pollutant emissions from vehicular and other mobile sources. HSC section 39618 classifies refrigerated trailers as off-road mobile sources under ARB jurisdiction.

More specifically, California's Air Toxics Program, established under California law by AB 1807 (Stats. 1983, Ch. 1047) and set forth in Health and Safety Code sections 39650 through 39675, mandates the identification and control of air toxics in California. The identification phase of the Air Toxics Program requires the ARB, with participation of other state agencies, such as the Office of Environmental Health Hazard Assessment (OEHHA), to evaluate the health impacts of, and exposure to, substances and to identify those substances that pose the greatest health threat as TACs. The ARB's evaluation is made available to the public and is formally reviewed by the Scientific Review Panel (SRP) established under Health and Safety Code section 39670. Following the ARB's evaluation and the SRP's review, the Board may formally identify a TAC at a public hearing. Following the identification of a substance as a TAC, Health and Safety Code sections 39658, 39665, 39666, and 39667 requires the ARB, with the participation of the air pollution control and air quality management

districts, and in consultation with affected sources and interested parties, to prepare a report on the need and appropriate degree of regulation for that substance.

In August 1998, the Board identified diesel PM as a TAC and in October 2000, the ARB published a "Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-fueled Engines and Vehicles." In the Diesel Risk Reduction Plan, the ARB indentified TRU emissions associated with refrigerated warehouse distribution centers as creating potential cancer risks and included off-road engines in the plan to reduce diesel PM emissions.

In October 2001, the OEHHA, published a "Prioritization of Toxic Air Contaminants Under the Children's Environmental Health Protection Act." Appendix C-1 of this document lists all of the TACs found in diesel PM in the section for Particulate Emissions from Diesel-Fueled Engines. Table I-1 lists these TACs. The Board has determined that there was not sufficient scientific evidence available to support "safe" threshold exposure levels for the TACs listed in Table I-1. (ARB, 2000; OEHHA, 2001). Exposure to these TACs and to other air pollutants emitted by diesel-powered TRU engines would be reduced once the proposed ATCM is adopted by the Board.

Table I- 1
Toxic Air Contaminants Found in
Diesel Engine Exhaust

Acetaldehyde	Chlorobenzene	Methanol
Acrolein	Chromium compounds	Methyl ethyl Keytone
Aniline	Cobalt compounds	Napthalene
Antimony compounds	Cresol	Nickel
Arsenic	Cyanide compounds	4-Nitrobiphenyl
Benzene	Dibenzofuran	Phenol
Berillium compounds	Dibutylphthalate	Phosphorous
Biphenal	Ethyl benzene	Polycyclic Organic Matter (including PAHs)
Bis [2-Ethylhexyl]phthalate	Formaldehyde	Propionaldehyde
1,3-Butadiene	Hexane	Selenium compounds
Cadmium	Lead compounds	Styrene
Chlorinated dioxins & dibenzofurans	Magnesium compounds	Toluene
Chlorine	Mercury compounds	Xylene isomers and mixtures

(OEHHA, October 2001)

D. Regulatory Status

This section provides a regulatory context for the proposed ATCM by briefly discussing significant existing federal, state, and local air quality regulations and programs that

apply to TRUs and TRU generator sets. It is not intended to address all of the air quality or other regulations that could possibly affect TRUs and TRU generator sets.

Federal and California Emission and Fuel Standards

Federal nonroad compression ignition engine emission standards are set forth for new engines in 40 Code of Federal Regulations (CFR) Part 89. California has harmonized with federal emission standards, as set forth in title 13 California Code of Regulations (CCR), Article 4, sections 2420-2427, under "Heavy Duty Off-road Diesel Cycle Engines." The off-road engine standards vary depending upon the engine model year and maximum rated power. Table I-2 shows the PM emission standards that TRU and TRU generator set engines were subject to Tier 1 and Tier 2.

TABLE I-2
Tier 1 and Tier 2 New Off-road CI Engine Standards (g/hp-hr)

HP Category	Compliance Year								
	1999	2000	2001	2002	2003	2004	2005	2006	2007
<25 hp	NA	0.75 (<11 hp)					0.60		
		0.60 (≥ 11 to <25 hp)							
≥ 25 to ≤ 50 hp	0.60					0.45			

Note: Light gray shaded areas indicate Tier 1 standards. Darker gray shaded areas indicate Tier 2 standards.

On April 15, 2003, U.S. EPA proposed more stringent Tier 4 standards for the control of emissions from nonroad compression ignition engines. ARB will adopt equivalent off-road standards in 2004. Table I-3 shows the proposed standards.

TABLE I-3
Proposed Tier 4 Nonroad CI Engine Standards (g/hp-hr)

HP Category	Compliance Year						
	2008	2009	2010	2011	2012	2013	2014
<25 hp	0.30[3] PM						
≥ 25 to <75 hp	0.22 PM					0.02 PM 3.5 NMHC+NOx	

Note: Light gray shaded area indicates the "interim" Tier 4 standard. The darker gray shaded area indicates the "long-term" Tier 4 standard.

Federal and California fuel standards specifically apply to manufacturers and distributors rather than to mobile sources or their operators. Nevertheless, these standards directly affect the fuel used in mobile sources, including TRUs and TRU generator sets. Fuel standards for sulfur content, aromatic content, and other fuel

[3] ARB and U.S. EPA will perform a technical review in 2007 to evaluate the DOC or filter-based standard for <25 hp category in the 2010 to 2013 timeframe. If a more stringent final level for Tier 4 is adopted for this horsepower category, then a revision to this ATCM may add an ULETRU engine certification performance standard for <25 hp TRUs and TRU generator sets.

components and parameters play a critical role in meeting emission standards. Federal commercial fuel standards are set forth in 40 CFR Part 80 and California fuel standards are set forth in title 13 California Code of Regulations sections 2281 and 2282 (diesel). In July, 2003, a revision to CCR title 13, section 2281 was adopted by the ARB which allows only very low sulfur diesel (<15 ppm) in diesel fuel starting in 2006. Activities involving California nonvehicular diesel fuel are also subject to this requirement as if it were vehicular fuel. U.S. EPA plans to adopt a similar sulfur restriction that would go into effect in 2006 for on-road fuel use and in 2010 for nonroad fuel use. Fuel suppliers for California must meet both federal and California fuel standards.

California Statutes and Local Air District Rules

In addition to harmonized state/federal off-road/nonroad diesel engine emission standards, TRUs are subject to several other air quality-related statutes and regulations in the California Health and Safety Code.

HSC section 41700 is an important statutory requirement that applies to any source of air pollution whatsoever (with some very narrow exceptions), that prohibits any person from discharging such quantities of air contaminants which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or the public, or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause or have the natural tendency to cause injury or damage to business or property."

HSC section 41701 also applies similarly to any source whatsoever and prohibits air contaminant emissions that obscure an observer's view to no more than Ringelmann 2 or an opacity of 40 percent.

Local air districts all have prohibitory rules that are at least as stringent as HSC sections 41700 and 41701. These two statutes and the local rules provide broad authority to air districts to enforce the statutory prohibition against any source whatsoever causing a nuisance or emitting excessive smoke.

Voluntary Retrofit Programs

Federal, State, and local programs have been developed to encourage less-polluting diesel engines. These programs include:

- U.S. EPA's Voluntary Diesel Retrofit Program;
- ARB's Carl Moyer Program
- EPA's "SmartWay Transport Initiative"

Although U.S. EPA plans to significantly reduce pollution from new diesel engines through several steps of new diesel engine emission standards, the effects of these rules will take many years to implement due to the long lives of diesel engines. EPA

has developed the Voluntary Diesel Retrofit Program to help make a difference in the immediate future. The program will address pollution from diesel construction equipment and heavy-duty vehicles that are currently on the road today. The Program is building a market for clean diesel engines by working with state, local and industry partners to create demonstration projects around the country. The Web site at http://www.epa.gov/otaq/retrofit/ is designed to help fleet operators, air quality planners in State/local government, and retrofit manufacturers understand this program, and to obtain the information they need to create effective retrofit projects.

ARB's Carl Moyer Memorial Air Quality Standards Attainment Program provides funds on an incentive-basis for the incremental cost of cleaner than required engines and equipment. Eligible projects include cleaner on-road, off-road, marine, locomotive and stationary agricultural pump engines, as well as forklifts, airport ground support equipment, auxiliary power units, and transport refrigeration units. The program achieves near-term reductions in emissions of oxides of nitrogen (NOx), which are necessary for California to meet its clean air commitments under the State Implementation Plan. In addition, local air districts use these NOx emission reductions to meet commitments in their conformity plans, thus preventing the loss of federal funding for local areas throughout California. The program also reduces particulate matter (PM), a component of diesel exhaust. A recent change to the program guidelines clarified the intent that TRUs are eligible for these funds.

In the spring of 2002, California voters passed Proposition 40, the California Clean Water, Clean Air, Safe Neighborhood Parks, and Coastal Protection Act. Proposition 40 allocates $50 million to the ARB over two years for distribution to air districts for projects that "affect air quality in State and local parks and recreation areas" in accordance with the Carl Moyer guidelines. Of these funds, the governor allocated $25 million to the ARB for the 2002/2003 fiscal year. Further information is available at http://www.arb.ca.gov/msprog/moyer/moyer.htm

EPA's SmartWay Transport initiative is a voluntary partnership between various freight industry sectors and EPA that establishes incentives for fuel efficiency improvements, emissions reductions affecting human health, especially in densely populated areas, and greenhouse gas emissions. The SmartWay Transport fleets component invites companies that either use or provide freight shipping services (shippers and carriers, respectively) to become SmartWay Transport partners by applying innovative strategies and technologies to improve fuel efficiency, reduce emissions, and promote new, clean technologies. Partners that meet program requirements and exceed performance thresholds will have SmartWay logo rights and get public visibility and recognition for having outstanding environmentally-efficient freight transport services. They will earn the right to highlight their environmental leadership to their customers and the public. Further information is available on the Web at www.epa.gov/otaq/smartway/index.htm

E. Summary

The proposed ATCM would reduce diesel PM emissions from TRU and TRU generator set engines sooner than what would be achieved through new engine standards, would provide information necessary to evaluate residual risk at larger facilities where TRUs operate, and would improve the accuracy of the TRU emissions inventory. The proposed ATCM would apply to all in-use TRUs and TRU generator sets that operate in California. Because TRUs and TRU generator sets can last for 30 years or more, an accelerated replacement or retrofit program is needed to assure that older, higher-emitting TRUs are either removed from the California population or emissions are reduced to meet more stringent in-use performance standards. This TRU ATCM is necessary because there are no air district regulations, local ordinances, and few (if any) written facility operating policies that address TRU emissions.

Voluntary TRU replacement and retrofit programs for TRUs have thus far been ineffective in removing old, higher emitting TRUs from the TRU population. Until recently, incentive programs have not been applied toward TRUs and then have only provided a limited amount of funding for specified purposes (e.g. NOx reductions). These incentive programs also usually require matching funds and are subject to future government budget allocations. Local funding programs, which are the source of most matching funds, have focussed on ozone precursor reductions, not PM reductions.

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II. NEED FOR CONTROL OF DIESEL PARTICULATE MATTER

In 1998, the Air Resources Board (ARB or Board) identified diesel particulate matter (diesel PM) as a toxic air contaminant (TAC). Diesel PM is by far the most important TAC and contributes over 70 percent of the estimated risk from air toxics today. In September 2000, the ARB approved the "Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles" (Diesel Risk Reduction Plan). The goal of the Diesel Risk Reduction Plan is to reduce diesel PM emissions and the associated cancer risk by 85 percent in 2020. In addition, in 2001, the Office of Environmental Health Hazard Assessment (OEHHA) identified diesel PM as one of the TACs that may cause children or infants to be more susceptible to illness pursuant to the requirements of Senate Bill 25 (1999, Escutia). Senate Bill 25 also requires the ARB to adopt control measures, as appropriate, to reduce the public's exposure to these special TACs (Health and Safety Code section 39669.5).

This proposed Airborne Toxic Control Measure (ATCM), to reduce diesel PM emissions from diesel-fueled transport refrigeration unit (TRU) engines, is one of a large group of regulations being developed to achieve the emission reduction goals of the Diesel Risk Reduction Plan for protecting the health of Californians by reducing the public's exposure to diesel PM. The proposed ATCM will also reduce emissions of volatile organic compounds (VOCs) and oxides of nitrogen (NOx), precursors to the formation of ozone.

This chapter describes the physical and chemical characteristics of diesel PM, and discusses the health effects of the pollutants emitted by diesel engines and the environmental benefits from the proposed regulation. As discussed below, it is important that steps be taken to reduce emissions from all diesel-fueled engines (including diesel-fueled TRU engines) to reduce public exposures to diesel PM and ozone, to make further progress in meeting the ambient air quality standards, and to improve visibility.

A. Physical and Chemical Characteristics of Diesel PM

Diesel engines emit a complex mixture of inorganic and organic compounds that exist in gaseous, liquid, and solid phases. The composition of this mixture will vary depending on engine type, operating conditions, fuel, lubricating oil, and whether or not an emission control system is present. The primary gas or vapor phase components include typical combustion gases and vapors such as carbon monoxide (CO), carbon dioxide (CO_2), sulfur dioxide (SO_2), oxides of nitrogen (NOx), reactive organic gases (ROG), water vapor, and excess air (nitrogen and oxygen). Mass emission rates also vary by engine. For example, an uncontrolled 1987 34 horsepower (hp) diesel TRU engine could have a diesel PM emission rate of 0.76 grams per horsepower-hour (g/hp-hr), while a 2004 model year engine is required to meet a 0.45 g/hp-hr emission rate, and under the proposed Tier 4 nonroad standards, that same size engine will be required to meet a 0.02 g/hp-hr emission rate in 2013.

The emissions from diesel-fueled engines also contain potential cancer-causing substances such as arsenic, nickel, benzene, formaldehyde, and polycyclic aromatic hydrocarbons (PAHs). There are over 40 substances in emissions from diesel-fueled engines listed by the United States Environmental Protection Agency (U.S. EPA) as hazardous air pollutants and by the ARB as TACs. Fifteen of these substances are listed by the International Agency for Research as carcinogenic to humans, or as a probable or possible human carcinogen. The list includes the following substances: formaldehyde, acetaldehyde, 1,3-butadiene, antimony compounds, arsenic, benzene, beryllium compounds, inorganic lead, mercury compounds, bis(2-ethylhexyl)phthalate, dioxins and dibenzofurans, nickel, polycyclic organic matter (POM) including PAHs, and styrene.

Diesel PM is either directly emitted from diesel-powered engines (primary particulate matter) or is formed from the gaseous compounds emitted by a diesel engine (secondary particulate matter). Diesel PM consists of both solid and liquid material and can be divided into three primary constituents: the elemental carbon fraction, the soluble organic fraction, and the sulfate fraction.

Many of the diesel particles exist in the atmosphere as a carbon core with a coating of organic carbon compounds, or as sulfuric acid and ash, sulfuric acid aerosols, or sulfate particles associated with organic carbon. The organic fraction of the diesel particle contains compounds such as aldehydes, alkanes and alkenes, and high-molecular weight PAH and PAH-derivatives. Many of these PAHs and PAH-derivatives, especially nitro-PAHs, have been found to be potent mutagens and carcinogens. Nitro-PAH compounds can also be formed during transport through the atmosphere by reactions of adsorbed PAH with nitric acid and by gas-phase radical-initiated reactions in the presence of oxides of nitrogen. Fine particles may also be formed secondarily from gaseous precursors such as SO_2, NOx, or organic compounds. Fine particles can remain in the atmosphere for days to weeks and travel through the atmosphere for hundreds to thousands of kilometers, while coarse particles deposit to the earth within minutes to hours and within tens of kilometers from the emission source.

Almost all of the diesel particle mass is in the fine particle range of 10 microns or less in diameter (PM_{10}). Approximately 94 percent of the mass of these particles are less than 2.5 microns in diameter $PM_{2.5}$. Diesel PM can be distinguished from noncombustion sources of $PM_{2.5}$ by the high content of elemental carbon with the adsorbed organic compounds and the high number of ultrafine particles (organic carbon and sulfate).

The soluble organic fraction (SOF) consists of unburned organic compounds in the small fraction of the fuel and atomized and evaporated lube oil that escape oxidation. These compounds condense into liquid droplets or are adsorbed onto the surfaces of the elemental carbon particles. Several components of the SOF have been identified as individual toxic air contaminants.

B. Health Impacts of Exposure to Diesel PM, Ambient PM, and Ozone

The proposed ATCM will reduce the public's exposure to diesel PM, as well as reduce ambient particulate matter. In addition, the proposed ATCM is expected to result in reductions in emissions of NOx and VOC, which are precursors to the formation of ozone in the lower atmosphere. The primary health impacts of these air pollutants are discussed below.

Diesel Particulate Matter

Diesel PM is of specific concern because it poses a lung cancer hazard for humans as well as a hazard from noncancer respiratory effects such as pulmonary inflammation. Because of their small size, the particles are readily respirable and can effectively reach the lowest airways of the lung along with the adsorbed compounds, many of which are known or suspected mutagens and carcinogens. More than 30 human epidemiological studies have investigated the potential carcinogenicity of diesel PM. On average, these studies found that long-term occupational exposures to diesel exhaust were associated with a 40 percent increase in the relative risk of lung cancer (OEHHA, 1998). However, there is limited specific information that addresses the variable susceptibilities to the carcinogenicity of diesel exhaust within the general human population and vulnerable subgroups, such as infants and children and people with preexisting health conditions. Also, the genotoxicity of diesel exhaust and some of its chemical constituents have been reported in a number of studies (OEHHA, 1998).

Diesel PM was listed as a TAC by ARB in 1998 after an extensive review and evaluation of the scientific literature by OEHHA (ARB, 1998). Using the cancer unit risk factor developed by OEHHA for the TAC program and modeled ambient concentrations of diesel PM, it was estimated that for the year 2000, exposure to ambient concentrations of diesel PM (1.8 micrograms per cubic meter [$\mu g/m^3$]) represented a health risk of 540 potential cancer cases per million people exposed over a 70-year lifetime.

Another significant health effect of diesel exhaust exposure is its apparent ability to act as an adjuvant in allergic responses and possibly asthma (Diaz-Sanchez et al., 1996, Takano et al., 1998, Diaz-Sanchez et al., 1999). However, additional research is needed at diesel exhaust concentrations that more closely approximate current ambient levels before the role of diesel PM exposure in the increasing allergy and asthma rates is established.

Ambient Particulate Matter

Numerous epidemiological studies have shown that an increase in the ambient PM concentration can cause adverse health effects. The key health effects

associated with ambient PM, of which diesel PM is a component, are premature mortality, aggravation of respiratory and cardiovascular disease (as indicated by increased hospital admissions and emergency room visits, school absences, work loss days, and restricted activity days), aggravated asthma, acute respiratory symptoms (including aggravated coughing and difficult or painful breathing), chronic bronchitis, and decreased lung function that can be experienced as shortness of breath (U.S. EPA, 2000; U.S. EPA, 2003).

Health impacts from exposure to the fine particulate matter ($PM_{2.5}$) component of diesel exhaust have been calculated for California, using concentration-response equations from several epidemiological studies. Both mortality and morbidity effects have been associated with exposure to both direct diesel $PM_{2.5}$ and indirect diesel $PM_{2.5}$, the latter of which arises from the conversion of diesel NOx emissions to $PM_{2.5}$ nitrates. It was estimated that 2000 and 900 premature deaths resulted from long-term exposure to both 1.8 $\mu g/m^3$ of direct $PM_{2.5}$ and 0.81 $\mu g/m^3$ of indirect $PM_{2.5}$, respectively, for the year 2000. The mortality estimates are likely to exclude cancer cases, but may include some premature deaths due to cancer, because the epidemiological studies did not identify the cause of death. Exposure to fine particulate matter, including diesel $PM_{2.5}$ can also be linked to a number of heart and lung diseases.

Ozone

Diesel exhaust consists of hundreds of gas-phase, particle-phase, and semi-volatile organic compounds, including typical combustion products, such as CO_2, hydrogen, oxygen, and water vapor, as well as CO, VOCs, carbonyls, alkenes, aromatic hydrocarbons, PAHs, PAH derivatives, and SOx - compounds resulting from incomplete combustion. Ozone is formed by the reaction of VOCs and NOx in the atmosphere in the presence of heat and sunlight. The highest levels of ozone are produced when both VOC and NOx emissions are present in significant quantities on clear summer days. This pollutant is a powerful oxidant that can damage the respiratory tract, causing inflammation and irritation, which can result in breathing difficulties.

Studies have shown that there are impacts on public health and welfare from ozone at moderate levels that do not exceed the national 1-hour ozone standard. Short-term exposure to high ambient ozone concentrations have been linked to increased hospital admissions and emergency visits for respiratory problems (U.S. EPA, 2000). Repeated exposure to ozone can make people more susceptible to respiratory infection and lung inflammation and can aggravate preexisting respiratory diseases, such as asthma. Prolonged (6 to 8 hours), repeated exposure to ozone can cause inflammation of the lung, impairment of lung defense mechanisms, and possibly irreversible changes in lung structure, which over time could lead to premature aging of the lungs and/or chronic respiratory illnesses such as emphysema and chronic bronchitis.

The subgroups most susceptible to ozone health effects include individuals exercising outdoors and, children and people with preexisting lung disease such as asthma, and chronic pulmonary lung disease. Children are more at risk from ozone exposure because they typically are active outside during the summer when ozone levels are highest. Also, children are more at risk than adults from ozone exposure because their respiratory systems are still developing. Adults who are outdoors and moderately active during the summer months, such as construction workers and other outdoor workers, are also among those most at risk. These individuals, as well as people with respiratory illnesses such as asthma, especially asthmatic children, can experience reduced lung function and increased respiratory symptoms, such as chest pain and cough, when exposed to relatively low ozone levels during prolonged periods of moderate exertion.

C. Health and Environmental Benefits from the Proposed Regulation

Reducing diesel PM emissions from TRUs will have both public health and environmental benefits. The proposed ATCM will reduce localized potential cancer risks associated with transport refrigeration units that are near receptors and will also contribute to the reduction of the general exposure to diesel PM that occurs on a region-wide basis due to collective emissions from diesel-fueled engines. Additional benefits associated with the proposed regulation include further progress in meeting the ambient air quality standards for PM_{10}, $PM_{2.5}$, ozone, and enhancing visibility.

Reduced Diesel PM Emissions

The estimated reductions in diesel PM emissions and the associated benefits from reduced exposures and risk are discussed in detail in Chapter IX.

Reduced Ambient Particulate Matter Levels

Reducing diesel PM will also help efforts to achieve the ambient air quality standards for PM. Both the State of California and the U.S. EPA have established standards for the amount of PM_{10} in the ambient air. These standards define the maximum amount of PM that can be present in outdoor air. California's PM_{10} standards were first established in 1982 and updated June 20, 2002. The current PM_{10} standard is more protective of human health than the corresponding national standard. Additional California and federal standards were established for $PM_{2.5}$ to further protect public health (Table II-1).

PM levels in most areas of California exceed one or more of current state PM standards. The majority of California is designated as non-attainment for the State PM_{10} standard (ARB 2002). Diesel PM emission reductions from diesel-fueled engines will help protect public health and assist in furthering progress in meeting the ambient air quality standards for both PM_{10} and $PM_{2.5}$.

Table II-1
State and National PM Standards

California Standard		National Standard	
PM_{10}			
Annual Arithmetic Mean	20 $\mu g/m^3$	Annual Arithmetic Mean	50 $\mu g/m^3$
24-Hour Average	50 $\mu g/m^3$	24-Hour Average	150 $\mu g/m^3$
$PM_{2.5}$			
Annual Arithmetic Mean	12 $\mu g/m^3$	Annual Arithmetic Mean	15 $\mu g/m^3$
24-Hour Average	No separate State standard	24-Hour Average	65 $\mu g/m^3$

The emission reductions obtained from the implementation of this proposed ATCM will result in lower ambient PM levels and significant reductions of exposure to primary and secondary diesel PM. Lower ambient PM levels and reduced exposure mean reduction of the prevalence of the diseases attributed to diesel PM, reduced incidences of hospitalizations and prevention of premature deaths.

Reduced Ambient Ozone Levels

Emissions of NOx and VOC, precursors to the formation of ozone in the lower atmosphere, will also be reduced by the proposed regulation. In California, most major urban areas and many rural areas continue to be non-attainment for the State and federal 1-hour ambient air quality standard for ozone. Table II-2 shows the State and federal ozone standards in effect. Controlling emissions of ozone precursors would reduce the prevalence of respiratory problems associated with ozone exposure, and would reduce hospital admissions and emergency visits for respiratory problems. Ozone can also have adverse health impacts at concentrations that do not exceed the 1-hour NAAQS.

Table II-2
State and National Ozone Standards

California Standard		National Standard
1 hour	0.09ppm (180 $\mu g/m^3$)	0.12ppm (235 $\mu g/m^3$)
8 hour		0.08 ppm (157 $\mu g/m^3$)

Improved Visibility

In addition to the public health effects of fine particulate pollution, fine particulates including sulfates, nitrates, organics, soot, and soil dust contribute to the regional haze that impairs visibility.

In 1999, the U.S. EPA promulgated a regional haze regulation that calls for states to establish goals and emission reduction strategies for improving visibility in 156 mandatory Class I national parks and wilderness areas. California has 29 of these national parks and wilderness areas, including Yosemite, Redwood, and Joshua Tree National Parks. Reducing diesel PM from diesel-fueled TRUs will help improve visibility in these Class I areas.

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III. PUBLIC OUTREACH

A. Outreach Efforts

Introduction

Public participation is a key requirement of California's regulatory process. The potential benefits of public participation rely upon public outreach to all communities, particularly those directly affected by a regulation. In addition, public outreach to low-income and minority communities is an important tool for fulfilling the Air Resources Board's (ARB or Board) commitment to environmental justice. Thus, throughout the development of the proposed airborne toxic control measure (ATCM), staff endeavored to identify affected industry and public organizations and to offer them opportunities to: 1) become informed about the proposed ATCM and the ATCM process; 2) provide pertinent information for ARB staff consideration; and 3) discuss comments and concerns.

Staff has used Internet web pages (http://www.arb.ca.gov/diesel/dieselrrp.htm and http://www.arb.ca.gov/diesel/tru.htm), and electronic and mail-out notices to alert organizations and individuals to workgroup meetings, public workshops, and the public hearing for the proposed ATCM. In addition, outreach efforts have included hundreds of personal contacts via telephone, electronic mail, regular mail, surveys, facility visits, and meetings. These contacts have included interactions with: transport refrigeration unit (TRU) and TRU generator set manufacturers, engine manufacturers, and operators; emission control system manufacturers; storage and/or distribution facility representatives; trucking, grocer, refrigerated warehouse and other local, national, and international trade association representatives; heating, refrigerating, and air conditioning engineers; representatives from federal agencies, including the U.S. Environmental Protection Agency (U.S. EPA) and U.S. Department of Agriculture (USDA); representatives from State agencies, including the Department of Health Services (DHS) and California Department of Food and Agriculture (DFA); representatives from California air pollution control and air quality management districts; and representatives from environmental, pollution prevention, public health advocate, and environmental justice organizations.

Major Outreach Activities

Major outreach activities for the proposed ATCM include:

- October 2000: publication of the "Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles" (DRRP);
- February 2001 and January 2002: diesel particulate matter (PM) public consultation meetings;
- 2001 - ongoing: information about DRRP, including the proposed ATCM, discussed at community meetings held throughout California;

Major Outreach Activities (continued)

- 2001- ongoing: California Diesel Risk Reduction Program Transportation Refrigeration Units web page (http://www.arb.ca.gov/diesel/tru.htm) and list serve development and maintenance;
- 2001-ongoing: California Air Pollution Control Officers Association Toxics Committee updates;
- 2001-2003: manufacturer, operator, and State agency information gathering;
- January 2002 - October 2002: 25 storage and/or distribution facility site visits and interviews;
- June 2001 - July 2003: discussions with TRU and TRU generator set manufacturers, engine manufacturers, and U.S. EPA regarding a special TRU engine certification test cycle to determine compliance with proposed federal Tier 4 non-road emission standards;
- November 2001 - ongoing: disseminate information and encourage testing and demonstration of available and emerging emission control methods in partnership with emission control system, engine, TRU and TRU generator set manufacturers and others;
- August 2002 - ongoing: help design and fund studies of TRU electric stand-by use in partnership with the California Energy Commission, Carrier-Transicold, Clean Fuel Connection, Inc., In-N-Out Burgers, Norco Egg Ranch, Raley's, Riverside County Transportation Commission, Sacramento Metropolitan Air Quality Management District, and Sacramento Municipal Utility District;
- January 2002 - July 2003: nine proposed ATCM workgroup meetings/conference calls;
- April 2002 - October 2003: five proposed ATCM public workshops, with Webcast on June 2003. [Note: public workshops were also announced in Refrigerated Transporter Business Picture (business@business.email.primedia.com), a weekly electronic mail update of refrigerated transportation news and trends with a circulation of 15,000];
- May 2003: "Fact Sheet -Transport Refrigeration Units (TRUs)" published on web page in English and Spanish;
- June 2003: tours of two produce packing facilities followed by continued dialog with representatives of California Citrus Mutual and Nisei Farmers League;
- July 2003: staff observation of heavy-duty vehicle inspection at Antelope weigh scales; and
- October 2003: notice for public hearing to consider adoption of proposed ATCM and availability of this Staff Report.

In addition, staff participated in or contributed to:

- November 2000-February 2002: Four International Diesel Retrofit Advisory Committee meetings;
- July 2003: Truckload Carrier Association, Refrigerated Division, Annual Meeting; and
- September 2003: Electric Material Handling/Electric Idle Reduction for Trucks Workshop, presented by Sacramento Municipal Utility District and Electric Power Research Institute at McClellan Park.

B. Summary of Public Involvement

The public was initially made aware of the ARB intention to address off-road diesel-fueled engine emissions by the publication of the DRRP in October 2000. The DRRP specifically identified several types of off-road diesel-fueled engines, including those associated with transportation refrigeration, and discussed strategies to achieve and/or verify in-use engine emission reductions, including replacement, retro-fit, and compliance testing (ARB, 2000).

Staff contacted major TRU and TRU generator set manufacturers, engine manufacturers, operators, and operator organizations both to alert affected industry and to gather information about the technology and operation of the equipment. The information from these sources was supplemented by approximately 25 facility tours and interviews, workgroup and workshop discussions, and data provided by State and local agencies. The results of these information-gathering activities are summarized throughout this Staff Report. In addition, the ARB contracted with the University of California, Riverside College of Engineering Center for Environmental Research and Technology (CE-CERT) to perform data-logging studies for the purpose of determining representative TRU runtimes and exhaust temperatures (ARB, 2003).

Staff discussed numerous regulatory approaches for controlling TRU and TRU generator set emissions with affected industry and the public during two public consultation meetings, nine workgroup meetings/conference calls, five public workshops, and a large number of stakeholder meetings, e-mails, and telephone conversations. In particular, staff tracked available and emerging control methods and facilitated communication among control system manufacturers and TRU and TRU generator set manufacturers, engine manufacturers, and operators. This continuing effort has resulted in a number of demonstration projects and studies that have provided important information regarding the feasibility and efficacy of various particulate matter control devices, retrofit technology, electrification, and alternative fuel use.

After evaluating available study results and stakeholder comments, staff reconsidered initial proposals for facility electrification and emission standards for new TRU and TRU generator set engines. Instead, staff proposes to require a

one-time major facility report in order to identify facilities, evaluate associated emissions, and determine the need for further regulation. In addition, staff has decided to harmonize California's new off-road engine emission standards with proposed federal Tier 4 new non-road engine emissions standards and require emission reductions for in-use equipment. For in-use TRU and TRU generator set engines, staff proposes performance standards that would require the utilization of best available control technology or other equally or more effective control methods. Furthermore, staff proposes early compliance credit as well as a phase-in period and multiple options for meeting in-use performance standards to provide the necessary flexibility and encouragement for achievement of maximum emission reductions as quickly as possible. The goal of the proposed ATCM is to achieve significant additional emission reductions from in-use equipment in conjunction with those anticipated from compliance with proposed federal Tier 4 standards for new engines.

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IV. DIESEL TRANSPORT REFRIGERATION UNITS (TRU) AND TRU GENERATOR SETS

A. Introduction to TRUs and TRU Generator Sets

Each day, Californians use numerous perishable foods and other commodities that must be stored and transported in temperature-controlled environments. Table IV-1 lists general categories of these products and includes a few specific examples of required or recommended storage-transport temperatures. Mechanical refrigeration, the primary means of controlling temperature during transport, uses Transport Refrigeration Units (TRU) and TRU generator sets to ensure that temperature-sensitive cargoes arrive safely and in good condition (USDA, 2000).

For the purpose of the proposed airborne toxic control measure (ATCM), "TRU" means refrigeration systems powered by integral internal combustion engines designed to control the environment of temperature-sensitive products that are transported in semi-trailer vans, truck vans, railcars, or shipping containers. Since many products must be protected from freezing as well as warm ambient temperatures, TRUs may be capable of both cooling and heating. In the transportation industry, the term "refrigerated" is often used to refer to heating, as well as cooling.

"TRU generator set" means a generator set that is designed and used to provide electric power to electrically-driven refrigeration units of any kind. This includes, but is not limited to, generator sets that provide electricity to electrically-powered refrigeration systems for semi-trailer vans and shipping containers. TRU generator sets are commonly used in conjunction with ocean-going cargo containers while being transported on land by railcars or semi-trailers.

For the purposes of the proposed ATCM, this chapter addresses TRU and TRU generator sets that are powered by diesel fuel. This chapter does not address the use of mechanical refrigeration powered solely by electricity, a vehicle chassis-driven engine, or fuels other than diesel. Nor does it address TRUs or TRU generator sets using other means of maintaining temperature control such as icing or cryogenic refrigerants.

TABLE IV-1
Temperature-Sensitive Commodities

Commodity	Required or Recommended Storage-Transport Temperature
Fresh Fruits and Vegetables Examples: apples bananas lettuce	 -1.1 to 4.4°C (30 to 40°F) 13.3 to 14.4°C (56 to 58°F) 0°C (32°F)
Dairy Products Examples: milk cheese ice cream	 0 to 1.1°C (32 to 34°F) 1 to 4°C (34 to 40°F) -29 to -26°C (-20 to -15°F)
Fresh and Cured Meat and Fresh Seafood Examples: fresh beef/pork/lamb bacon (cured, farm style) pork sausages	 0 to 1.1°C (32 to 34°F) 16 to 18°C (61 to 64°F) 0°C (32°F)
Poultry and Eggs Examples: fresh chicken/turkey fresh eggs	 -2.2 to 0°C (28 to 32°F) -3 to 1.1°C (26 to 34°F)
Frozen Foods	-18°C (0°F) or below
Live Plants Example: Christmas Trees	 -5 to 10°C (23 to 50°F)
Film Examples: photographic, x-ray	 Generally recommend ≤21°C (≤70°F); avoid fluctuations.
Human Blood and Blood Products Example: source plasma	 >-5 but <10°C (>23 but <50°F)
Pharmaceuticals Example: insulin	 Refrigerate [Can be kept unrefrigerated up to 28 days if temperature is <30°C (<86°F). Always keep at temperature > 0°C (>32°F)].
Chemicals Example: ion exchange resins	 >-18 but <30 to 32°C (>0 but <86° to 90°F)

(CFR, 2002; DOW, 2003; Lilly, 2000; NARA, 2001; P&O Nedlloyd, 2003; USDA, 2000)

B. TRU and TRU Generator Set Manufacturers

Although the proposed ATCM contains no specific requirements for the manufacturers of TRUs, TRU generator sets or associated engines, manufacturers are expected to play a critical role in providing compliant equipment to owners/operators. Some of these manufacturers have already begun to test available and emerging emission reduction control technology and fuel alternatives in order to determine compatibility with existing equipment and reliability across a broad range of operating modes.

Currently, all TRUs and 95 percent of TRU generator sets used in California are manufactured by the Carrier Transicold Division, Carrier Corporation, or by

Thermo King, Ingersoll-Rand Corporation. About 5 percent of TRU generator sets used in California are manufactured by Klinge Corporation or Taylor Power Products. Recently, Zanotti Transblock North America began distribution and announced plans for assembling TRUs in North America.

The primary manufacturers of TRU and TRU generator set engines are Izusu American Motors, Kubota Engine America Corporation, and Yanmar Diesel America Corporation. The engines used in TRUs and TRU generator sets are designed solely to power refrigeration units and are not used for other applications. They are manufactured separate from the refrigeration units and are installed at TRU or TRU generator set manufacturing plants (Feitel, 2002; Klinge, 2001; Refrigerated Transporter, 2003; Sem, 2001).

C. TRU and TRU Generator Set Configurations

Once the manufacture of TRUs and TRU generator sets is complete, they may be configured in several different ways with semi-trailer vans, truck vans, railcars, and shipping containers produced by a large number of commercial transport manufacturing companies. Figure IV-1 identifies eight different TRU and TRU generator set configurations and Figure IV-1a through d depicts the more common configurations. These TRU- and TRU generator set-equipped conveyances are sold or leased to thousands of different commodity transporters as described in Section D of this chapter (ARB, 2003).

FIGURE IV-1
TRU and TRU Generator Set Configurations

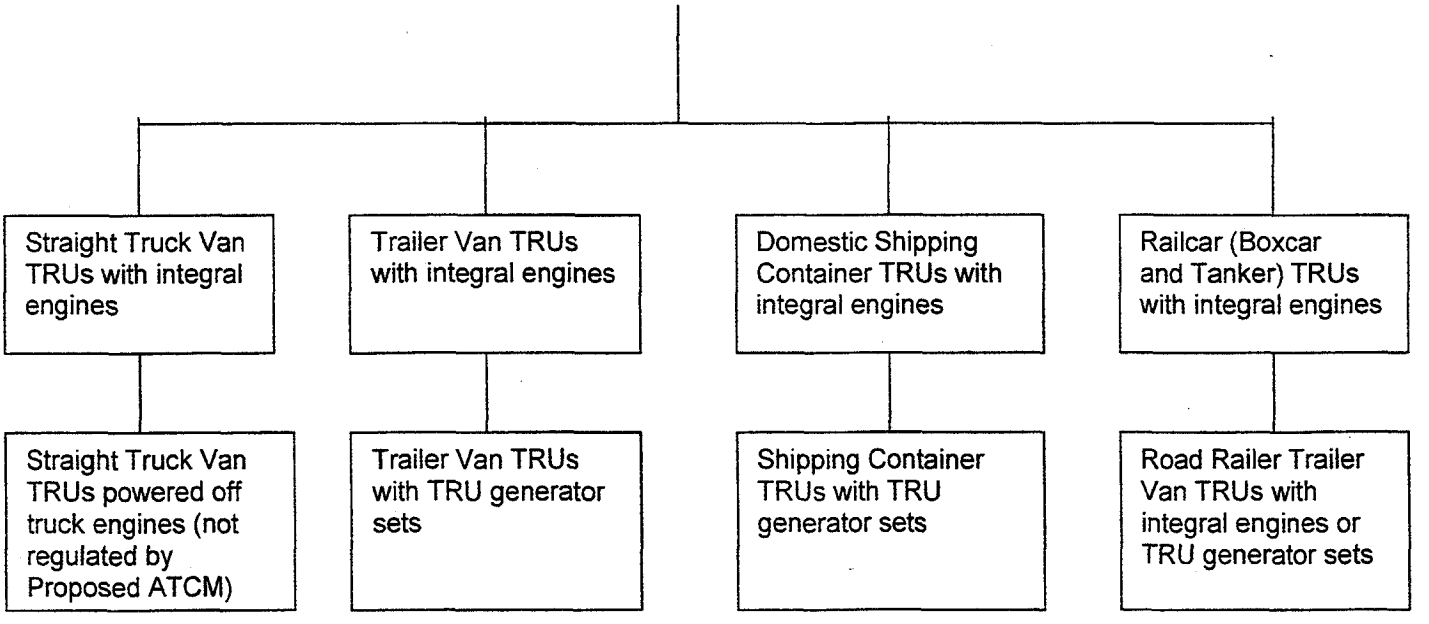
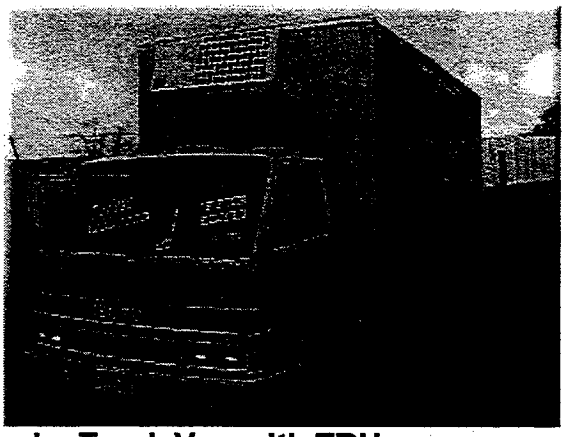


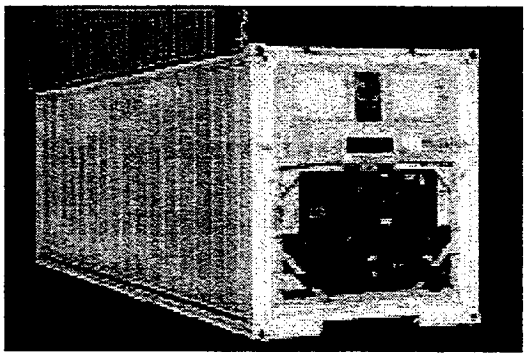
FIGURE IV-1 a-d

a. Semi-trailer Van with TRU



b. Truck Van with TRU

c. Railcar with TRU



d. Shipping Container that would use a TRU Generator Set on the Road

D. General Operation and Description of Commodity Transporters that use TRUs AND TRU Generator Sets

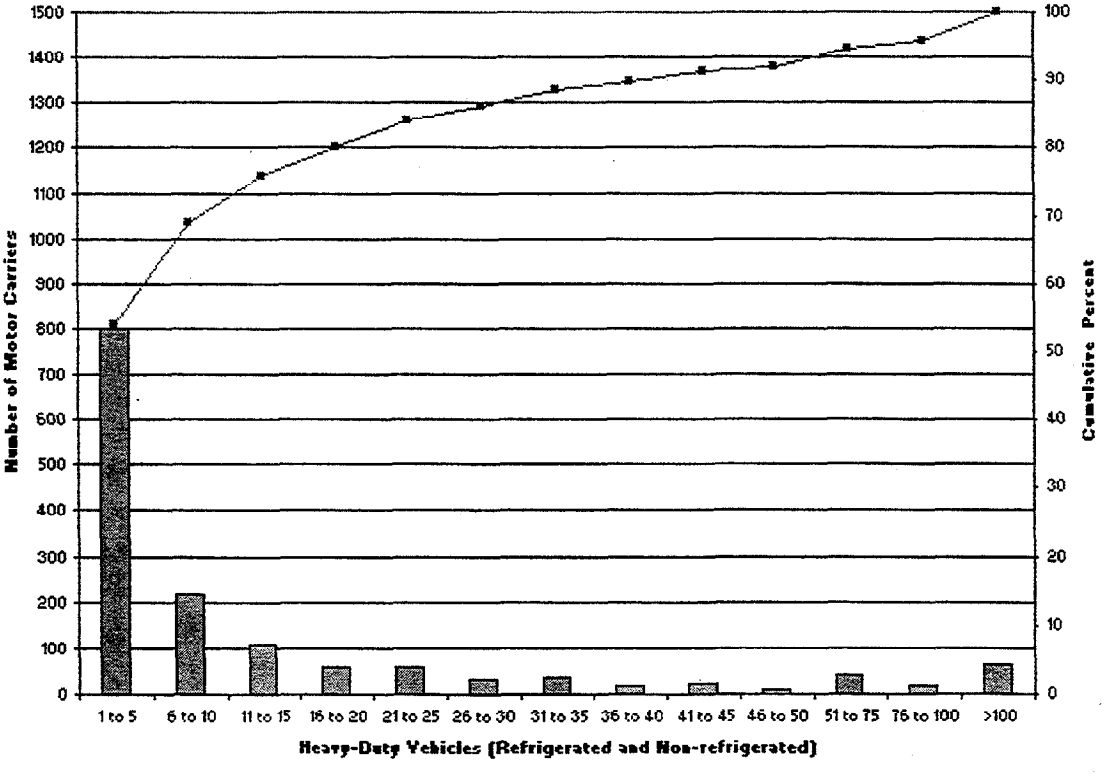
General Operation of Commodity Transporters

Based upon the 1997 Commodity Flow Survey published by the U.S. Census Bureau, semi-trailer vans and truck vans are estimated to transport approximately 83 percent by weight of all commodities in California. These motor vehicles may operate locally, regionally, intra-State, inter-State, or any combination thereof. They may also operate outside the United States in Canada and/or Mexico. However, they are usually based at (i.e., maintained at and/or dispatched from) one or more fixed locations or "terminals." The remaining 17 percent by weight of commodities are transported by air, water, pipeline, rail, or multiple modes. Staff identified commodity categories likely to require temperature control to estimate that approximately 11 percent of all commodities transported in California are likely to require the use of a TRU or TRU generator set (ARB, 2003; US Census, 1997).

Semi-trailer Van and Truck Van Operators

Semi-trailer van or truck van operators may be single individuals, partnerships, corporations, or other entities that own or lease these motor vehicles. Staff used data from the California Highway Patrol (CHP) Biennial Inspection of Terminals (BIT) Program and motor carrier insurance industry databases to estimate that between 1,500 and 5,500 California-based single and fleet motor carriers own or operate semi-trailer vans and truck vans equipped with TRUs. Motor carriers with more than one semi-trailer van/truck van frequently own or operate non-temperature-controlled heavy-duty vehicles as well as TRU-equipped vehicles. Figure IV-2 shows that 80 percent of California-based motor carriers with TRUs own or operate 20 or fewer temperature-controlled and/or non-temperature-controlled heavy-duty vehicles. About 40 percent of California-based motor carriers are for-hire single-vehicle owners/operators or commercial fleets and about 60 percent are private company/corporation fleets. Staff has concluded that public agency use of TRU-equipped vehicles is uncommon based upon TRU procurement information from the Department of General Services, interviews with several school districts, and a survey of 33 Department of Correction institutions (ARB, 2002; CHP, 2003; Duehring, 2002; Martis, 2003; TTS, 2003).

FIGURE IV-2
Estimated Fleet Size of Semi-Trailer Van/Truck Van Owners/Operators with (or likely to have) TRUs



Railcar and Shipping Container Operators

Railcar and shipping container carriers own or lease the refrigerated cars and containers they operate. Responsibilities for various aspects of operation and/or maintenance are frequently defined by the terms of a lease or other contractual agreement with railroad contractors, ship operators, shipping/receiving terminals, or others.

There is insufficient information to estimate the number of railcar carriers that operate in California. Approximately 30 refrigerated railcar carriers operated in the United States during 2002 and 2003 based upon information from the Universal Machine Language Equipment Register or UMLER file. The UMLER file is a comprehensive North American rail equipment information database used in distributing equipment, planning routes, etc. Many of the approximately 30 refrigerated railcar carriers that operated in the United States could also have operated in California.

Staff estimates that nearly 40 different refrigerated shipping container carriers operated in California during 2002 based upon shipping line refrigerated throughput for California's busiest oceanic shipping terminal, the Port of Long Beach (ARB, 2003; Chavez, 2003; Maples, 2003).

E. Terminals and Facilities where TRUs and TRU Generator Sets Operate

TRU or TRU generator set-equipped semi-trailer vans, truck vans, railcars, and shipping containers tend to congregate at "terminals" and "facilities" as defined in Appendix H of this Staff Report. Terminals and facilities may be co-located and facilities may own or operate TRUs or TRU generator sets independent of the vehicles that visit them. Although terminals and facilities are located throughout the State, they appear to be clustered near transportation corridor intersects and are often located in or near population centers in northern and southern California. As described in Chapter V, diesel PM emissions from TRU and TRU generator set engine operation at terminals and/or facilities may result in elevated diesel particulate matter (PM) concentrations in neighborhoods surrounding those sites.

The CHP BIT database for 2003 lists nearly 65,000 terminals for approximately 50,000 motor carriers in California. There are more terminals than motor carriers because a single motor carrier may operate from several terminal locations in the State. About one-third of the estimated 1,500 to 5,500 California-based motor carriers with (or likely to have) TRUs operate from multiple terminal locations. Since railcar and container operators may also own and/or operate semi-trailers to transport goods to wholesale and retail distribution facilities, the CHP database includes rail yards and "intermodal facilities" as defined in Appendix H that are co-located with motor carrier terminals. In addition, networks of rail yards and

shipping terminals provide a system for servicing and dispatching railcars and shipping containers.

Comprehensive information regarding facilities frequented by TRUs and/or TRU generator sets is not available; however, staff used licensing agency databases provided by the California Department of Health Services (DHS), Department of Food and Agriculture (DFA), and U.S. Department of Agriculture (USDA) to identify approximately 7,740 facilities that handle refrigerated foods. These facilities include wholesale food distribution, milk plant, meat and poultry, and egg handling facilities (CHP, 2003; DFA, 2002; DHS, 2003; USDA, 2003).

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V. EMISSIONS, EXPOSURE, AND RISK FROM TRANSPORT REFRIGERATION UNIT OPERATIONS

Although transport refrigeration units (TRU) and TRU generator sets have relatively small engines, in the normal course of business, they can congregate in large numbers at distribution centers, ports, truck stops, and other facilities where their combined emissions could pose a significant health risk to those that live and work nearby. Exposure to these emissions could result in increased cancer risks and non-cancer health risks, such as irritation to the eyes and lungs, allergic reactions in the lungs, asthma exacerbation, blood toxicity, immune system dysfunction, and developmental disorders. Because ambient monitoring results are not available for diesel particulate matter (PM), estimates of the level of cancer risk are made using emission factors and various modeling techniques, as discussed below.

A. Estimation of California TRU and TRU Generator Set Populations and Emissions

Number of TRUs and TRU Generator Sets in California

Estimating the number of TRUs and TRU generator sets in California is difficult because there is no comprehensive registration program for this specific equipment, nor for the terminals or facilities where they congregate. In addition, Statewide information about TRUs and TRU generator sets has not been available from industry organizations. Therefore, staff estimated the year 2000 population of TRUs and TRU generator sets summarized in Table V-1 based upon national sales data and information from TRU engine manufacturers.

For the year 2000, the staff estimates that approximately 36,800 TRUs operating in California were associated with heavy-duty semi-trailer vans or truck vans. Table V-1 shows one-quarter of TRUs with 25 to 50 horsepower (hp) engines were associated with semi-trailer vans and truck vans based outside of California. The remaining TRUs were associated with semi-trailer vans and truck vans based in California. Air Resources Board (ARB) staff used the estimated number of California-based motor carriers with (or likely to have TRUs) (See Section D of Chapter IV) the estimated number of TRUs, and interviews with facility representatives, to estimate a range of 1 to 1,300, and an average of 5 to 20, TRUs per semi-trailer van/truck van operator.

According to data from the Universal Machine Language Equipment Register (UMLER file), approximately 8,800 mechanically-refrigerated railcars were operating in the United States in February 2002. Based upon UMLER information, national sales data, and surveys of several railroad operators in California, staff estimates that an average of 1,700 TRU-equipped railcars with 25 to 50 hp engines were operating in California at any given time in the year 2000.

TABLE V-1
Summary of Estimated
TRUs and TRU Generator Sets in California (Year 2000)

Transportation Mode	Horsepower	Number of TRUs	Number of TRU Generator Sets
California-based truck van	<15	4,600	Not Applicable
California-based truck van	15-25	1,900	Not Applicable
California-based semi-trailer	25-50	22,800	Not Applicable
Out-of-State semi-trailer	25-50	7,500	Not Applicable
Railcar	25-50	1,700	Not Applicable
California-based container on semi-trailer/railcar	25-50	Not Applicable	1,850
Total		**38,500**	**1,850**

Based on data provided by TRU generator set manufacturers and useful life, growth factor, and other assumptions in the Air Resources Board (ARB) OFFROAD model (See Appendix D of this Staff Report), staff estimates that approximately 1,850 TRU generator sets with 25 to 50 hp engines were operating in California in the year 2000. Generator sets are typically used to power the refrigeration units of shipping containers. Only a few land-transported domestic shipping containers are equipped with TRUs, the remaining use a generator set to provide electrical power to the shipping container refrigeration unit (ARB, 2003a; ARB, 2003b; CHP, 2003; Maples, 2003; TTS, 2003).

TRU and TRU Generator Set Emissions

Table V-2 shows Statewide emissions for year 2000 PM and oxides of nitrogen (NOx) emission estimates for TRUs and TRU generator sets. Because only diesel engine emissions were addressed in this analysis, the PM estimates may be considered to be diesel PM estimates. The TRU estimates are based on emission rates, population, and other data from the ARB OFFROAD model (See Appendix D). Since TRU generator sets use the same engines as 25 to 50 hp-size TRUs, staff used TRU engine emission rates from the ARB OFFROAD model and TRU generator set population, activity, and load factor data from manufacturers to calculate estimated year 2000 emissions for TRU generator sets. Because recent information from manufacturers indicates that emissions associated with TRU and TRU generator set engines may be 25 percent lower than other off-road engines of a similar horsepower, all PM emissions in

Table V-2 have been reduced by 25 percent from the OFFROAD Model Change Technical Memo (See Appendix D) to avoid overestimating diesel PM from this equipment. The TRU emissions inventory will continue to be refined as data is collected through the implementation of the proposed Airborne Toxic Control Measure (ATCM). Based upon the adjusted tons per day estimate, in 2000, an estimated total of 745 tons per year of diesel PM were emitted from TRUs and TRU generator sets in California. This means that TRU and TRU generator set emissions constitute approximately 2.6 percent of the total Statewide diesel PM emissions (i.e., 28,000 tons per year) estimated in the ARB "Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles," October, 2000.

TABLE V-2
Estimated Statewide Emissions for Year 2000
TRU and TRU Generator Sets (tons per day)

Horsepower	PM	NOx
<15 (truck/trailer)	0.04	0.84
15-25 (truck/trailer)	0.03	0.44
25-50 (truck/trailer)	1.36	12.67
25-50 (out-of-State truck/trailer)	0.45	4.18
25-50 (rail)	0.10	0.93
25-50 (generator sets)	0.05	0.52
Total	**2.03**	**19.58**

Tables V-3 and V-4 show estimated year 2010 and 2020 emissions for TRUs predicted by the ARB OFFROAD model and for TRU generator sets as calculated by staff using ARB OFFROAD model assumptions and manufacturers data. As in Table V-2, all PM emission estimates in Tables V-3 and V-4 have been reduced by 25 percent from the OFFROAD Model Change Memo (See Appendix D) because recent information from manufacturers indicate emissions associated with TRU and TRU generator set engines may be 25 percent lower than other off-road engines of a similar horsepower.

Estimates for 2010 and 2020 reflect only effective emission standards to date, not the proposed ATCM requirements or proposed United States Environmental Protection Agency (U.S. EPA) Tier 4 standards. Chapters VII and IX of this Staff Report discuss how the proposed ATCM and the U.S. EPA Tier 4 standards are expected to affect diesel PM and other air pollutant emissions (ARB, 2000; ARB, 2003a; ARB, 2003b).

TABLE V-3
Estimated Statewide Emissions for Year 2010
TRU and TRU Generator Sets (tons per day)

Horsepower	PM	NOx
<15 (truck/trailer)	0.04	0.81
15-25 (truck/trailer)	0.03	0.47
25-50 (truck/trailer)	1.65	16.37
25-50 (out-of-State truck/trailer)	0.55	5.40
25-50 (rail)	0.12	1.21
25-50 (generator sets)	0.07	0.66
Total	**2.46**	**24.92**

TABLE V-4
Estimated Statewide Emissions for Year 2020
TRU and TRU Generator Sets (tons per day)

Horsepower	PM	NOx
<15 (truck/trailer)	0.07	1.00
15-25 (truck/trailer)	0.04	0.55
25-50 (truck/trailer)	2.04	25.00
25-50 (out-of-State truck/trailer)	0.68	8.25
25-50 (rail)	0.15	1.84
25-50 (generator sets)	0.13	1.56
Total	**3.11**	**38.20**

Effect of Engine Size, Age, and Operation on Emissions

Generally, emissions of diesel PM and other air pollutants are expected to increase with the size, age, and operating hours of the engine associated with a TRU or TRU generator set. A brief discussion of size, age, and operation has been included because these factors may indicate potential areas for emission reduction.

1. Size and Age

The population inventory estimates TRU and TRU generator set engines to range from less than 15 to 50 hp with the most common size being about 35 hp.

Based upon manufacturer data, staff estimates the useful life (i.e., the age at which at least 50 percent of the originally sold equipment population still exists) of TRU and TRU generator set engines at 10 years; however, some of the remaining engines could last twice as long. Staff facility inspections and interviews indicate that the age of engines associated with TRUs and TRU generator sets ranges from new (i.e., the current model year) to up to 30 or more years old. There is limited emission rate information available on uncontrolled 50 hp or less engines manufactured prior to 1998. These pre-1998 engines are expected to emit significantly more air pollutants than those manufactured

in later model years. Thus, a large, later model engine may actually emit less diesel PM and other pollutants than a smaller, but older, TRU or TRU generator set engine (ARB, 2003a; ARB, 2003b).

2. TRU and TRU Generator Set Operation

The staff estimates that TRUs and TRU generator sets operate an average of 1,000 to 1,500 hours per year (i.e., approximately 3 to 4 hours per day). Daily operating hours for individual TRUs and TRU generator sets depend upon many variables, including: ambient temperature; cargo size; commodity air flow requirements and set point (i.e., required or recommended transport temperature); mode of transport; trip length; refrigerated compartment insulation; number of deliveries (i.e., door openings); and facility loading and unloading variables.

TRU and TRU generator sets may or may not operate continuously while perishable cargo is in transit. Some TRUs are designed to cycle on and off while maintaining a set point temperature. Also, when possible, semi-trailer van and truck van drivers shut off TRUs during delivery stops in order to prevent icing and preserve diesel fuel. However, multi-temperature loads are likely to require TRU operation during deliveries in order to preserve air flow and temperature requirements in each compartment of a trailer van. For goods requiring continuous air flow (e.g., fresh fruits and vegetables susceptible to mold), TRU engines must run continuously to generate power for electrically-driven fans. Other goods (e.g., meat, dairy products, and unpasteurized beer) only require the engine to run as needed to maintain a set point temperature.

TRU generator sets do not cycle on and off as some TRUs do. However, while aboard ship, the refrigeration units of temperature-controlled shipping containers typically use the ship's power rather than TRU generator set engines. At large seaports, such as Oakland and Long Beach, a refrigerated container uses shore power until it is placed on a flat-bed railcar or semi-trailer. At smaller shipping yards, 25 to 50 hp "pin-on" TRU generator sets provide the necessary power to run the refrigeration unit. Generally, a "pin-on" TRU generator set is also used for a container's land journey. In addition, a small number of semi-trailers are equipped with TRU generator sets that can provide power to container refrigeration units.

Based upon interviews conducted by staff at facilities served by semi-trailer vans and truck vans, the typical trip length ranges from 20 minutes for a local delivery to several days for a long-haul delivery. Facility representatives indicate that the average time semi-trailer vans and truck vans spend on the road is about 13 hours per trip. A TRU could be expected to operate from one-half to all of the transit time, depending on the number of deliveries and on whether or not the semi-trailer van or truck van carries an additional temperature-sensitive cargo on "back-haul" (i.e., the return trip to the terminal and/or storage and distribution facility).

Additional variables that influence the operation and emissions of TRUs and/or TRU generator sets at facilities, include: the number of in-bound and out-bound loads per week; size and variety of cargoes handled; loading methods; and number of available workers, loading dock doors, and parking spaces. Moreover, TRU and/or TRU generator set operation at a single facility may vary depending upon the season, ambient temperatures, and changes in market demand and/or products.

At storage and distribution facilities, semi-trailer and truck van TRUs are usually operated before loading (i.e., to "pre-chill" the cargo area) and sometimes during loading and unloading. The pre-chill time may range from zero to two hours depending upon the van size, cargo set point temperature, TRU cooling capacity, and ambient temperature. For example, to prevent the adverse effects of thawing and re-freezing, pre-chilling is a common practice when transporting ice cream which has a set point temperature of -29°C (-20°F). Trailer vans tend to take longer to pre-chill because they are larger than truck vans. Also, pre-chilling takes longer during California's warm summer months than at other times of the year.

Loading or unloading cargo usually takes about one hour or less. Semi-trailer vans tend to take longer to load or unload because they are usually larger and carry more cargo than truck vans. Most storage and distribution facilities schedule appointments for loading and unloading, but a driver that arrives early to unload must operate the TRU while waiting for an available loading dock door and personnel to do the unloading. In addition, TRUs must operate during any delay between loading and dispatch unless the facility is one of the few that provides, and the TRU is equipped to operate on, electrical stand-by power. Such delays are not unusual and may last between zero and 24 hours depending upon driver availability and scheduling. Departure times are usually scheduled so loads will arrive at their destination at a predetermined time when unloading personnel are available (ARB, 2003a;
ARB, 2003b).

UC Riverside, College of Engineering Center for Environmental Research and Technology (CE-CERT) conducted data gathering and analysis for ARB to learn more about TRU operation. Specific goals were to learn about representative TRU engine runtimes (e.g. non-mobile engine runtime at facilities, mobile engine runtime on the road), and TRU engine exhaust temperature profiles (e.g. percentage of time at various exhaust temperatures). Trailer TRUs from an egg distribution company, a grocery distribution company, and a wholesale restaurant supply company were instrumented with thermocouples, global positioning system (GPS) units, and data loggers. Appendix J includes an example plot of this data.

Staff recognizes that this data represents only three of many possible industry types and that operations may differ from one facility to the next within the industry types studied. A final report had not been completed.

B. An Overview of Health Risk Assessment

A health risk assessment (HRA) is an evaluation or report that a risk assessor (e.g., ARB, district, consultant, or facility operator) develops to describe the potential a person or population may have of developing adverse health effects from exposure to diesel PM emissions or from other toxic air contaminants (TACs). Some health effects that are evaluated could include cancer, developmental effects, or respiratory illness. The exposure pathways included in an HRA depend on the TACs that a person (receptor) may be exposed to, and can include breathing, the ingestion of soil, water, crops, fish, meat, milk, and eggs, and dermal exposure. For this HRA, we are evaluating the cancer health impacts for diesel particulate via the breathing or inhalation pathway only.

Generally, to develop an HRA, the risk assessor would perform or consider information developed under the following four steps. The four steps are Hazard Identification, Dose-Response Assessment, Exposure Assessment, and Risk Characterization.

Hazard Identification

In the first step, the risk assessor would determine if a hazard exists, and if so, would identify the exact pollutant(s) of concern and the type of effect, such as cancer or non-cancer effects.

For this assessment, the pollutant of concern, diesel particulate from internal combustion engines, has been formally identified under the Assembly Bill (AB) 1807 Program as a TAC through an open, regulatory process by the ARB (ARB 1998a).

Dose-Response Assessment

In this step of risk assessment, the assessor would characterize the relationship between exposure to a pollutant and the incidence or occurrence of an adverse health effect.

This step of the HRA is performed for the ARB by Office of Environmental Health Hazard Assessment (OEHHA). OEHHA supplies these dose-response relationships in the form of cancer potency factors or unit risk factors (URFs) for carcinogenic effects and reference exposure levels (RELs) for non-carcinogenic effects. The URFs and RELs that are used in California can be found in one of three references: (1) The OEHHA Air Toxics Hot Spots Program Risk Assessment Guidelines, Part III, Technical Support Document for the Determination of Noncancer Chronic Reference Exposure Levels, January, 2001; (2) The OEHHA Air Toxics Hot Spots Program Risk Assessment Guidelines, Part I, The Determination of Acute RELs for Airborne Toxicants, March 1999; and (3) The OEHHA Air Toxics Hot Spots Program Risk Assessment Guidelines, Part II, Technical Support Document for Describing Available Cancer Potency Factors, April 1999. The individual URF for diesel particulate from internal combustion engines used for this HRA is 3.0×10^{-4} per microgram per cubic meter ($\mu g/m^3$) ambient concentration of diesel particulate.

Exposure Assessment

In this step of the risk assessment, the risk assessor estimates the extent of public exposure by looking at who is likely to be exposed, how exposure will occur (e.g., inhalation and ingestion), and the magnitude of exposure.

For TRU operations, the receptors that are likely to be exposed include residents or off-site workers located near the facility. Onsite workers certainly could also be impacted by the emissions; however, they are not included in this HRA because Cal/OSHA has jurisdiction over on-site workers. Exposure was evaluated for diesel particulate via the breathing or inhalation pathway only. The magnitude of exposure was assessed through the following process. Emission rates were developed using emission parameters determined from site visits, and from facility and manufacturer data gathering, and input from industry representatives. During the site visits, other information such as physical dimensions of the source, operation schedules, and receptor locations were obtained. Computer air dispersion modeling was used to provide downwind ground-level concentrations of the diesel PM at near-source locations.

Risk Characterization

This is the final step of risk assessment. In this step, the risk assessor combines information derived from the previous steps. Modeled concentrations, which are determined through exposure assessment, are combined with the URF for cancer risk determined under the dose-response assessment. This step integrates this information to quantify the potential cancer risk and/or chronic or acute noncancer effects.

C. The Tools used for this Risk Assessment

The tools and information that are used to estimate the potential health impacts from a facility include air dispersion modeling and pollutant-specific health effects values. Information required for the air dispersion model include emission rate estimates, physical descriptions of the source, emission release parameters, and meteorological data. Combining the output from the air dispersion model and the pollutant-specific health values provides an estimate of the off-site potential cancer and non-cancer health impacts from the emissions of a TAC. For this assessment, we are estimating the potential health impacts from diesel PM emissions during TRU operations. A brief description of the air dispersion modeling and pollutant-specific health effects values is provided in this Chapter. A more detailed discussion of the air dispersion modeling and parameters used for determining individual cancer risk is presented in Appendix E.

Air Dispersion Modeling

Air dispersion models are used to estimate the downwind, ground-level concentrations of a pollutant after it is emitted from a facility. The downwind concentration is a function of the quantity of emissions, release parameters at the source, and appropriate meteorological conditions. The two models that were used for this HRA are SCREEN3, version 96043, and Industrial Source Complex Short Term (ISCST3), version 02035. Appendix E provides additional details on the modeling results illustrating how the outputs from these models are used to calculate potential health impacts. Appendix F provides the results of the sensitivity studies used to determine the variability of results due to changes in modeling parameters. The U.S. EPA recommends the SCREEN3 model for first order screening calculations and ISCST3 model for refined air dispersion modeling (U.S. EPA, 1995a; U.S. EPA, 1995b). Both models are currently used by the ARB, air districts, and other states.

Pollutant-Specific Health Effects Values

Dose-response or pollutant-specific health effects values are developed to characterize the relationship between an exposure to a pollutant and the incidence or occurrence of an adverse health effect. A URF or cancer potency factor is used when estimating potential cancer risks and RELs are used to assess potential non-cancer health impacts.

A URF is defined as the estimated upper-confidence limit (usually 95%) probability of a person contracting cancer as a result of constant exposure to a concentration of one microgram per cubic meter ($\mu g/m^3$) over a 70-year lifetime. In other words, using the URF for diesel particulate, 3.0×10^{-4} $(\mu g/m^3)^{-1}$, the potential excess cancer risk for a person continuously exposed over a 70-year lifetime to 1.0 $\mu g/m^3$ of diesel particulate is estimated to be no greater than 300 chances in 1 million (OEHHA, 2002).

D. Potential Health Effects of Diesel Exhaust Particulate Matter

This section summarizes the potential health impacts that can result from exposure to diesel particulate, both cancer and non-cancer health effects. The probable route of human exposure to diesel particulate is inhalation. In August 1998, the ARB formally identified diesel particulate as a TAC following a 10-year review process (ARB, 1998a). This marked the completion of the identification phase of the process to address the potential for adverse health effects associated with diesel PM emissions.

Although OEHHA has shown both chronic cancer and non-cancer impacts due to exposure to diesel PM, the cancer health risk impacts are so much higher than the non-cancer health impacts, only cancer risks were quantified for this assessment.

Cancer

The International Agency for Research on Cancer (IARC) concluded in 1989 that there is sufficient evidence that whole diesel engine exhaust probably causes cancer in humans and classified diesel exhaust in Group 2A: Probable human carcinogen (IARC, 1989). The OEHHA staff has performed an extensive assessment of the potential health effects of diesel PM, reviewing available carcinogenicity data. The OEHHA concluded that exposures to diesel PM resulted in an increased risk of cancer.

Epidemiological studies in truck drivers, transport and equipment workers, dock workers, and railway workers, reported a statistically significant increase in the incidence of lung cancer associated with exposure to diesel exhaust. Two studies reported no category with a risk ratio elevated for exposure to diesel exhaust (ARB 1998b).

Non-cancer

The OEHHA found that exposures to diesel PM resulted in an increase in long-term (chronic) non-cancer health effects including a greater incidence of cough, labored breathing, chest tightness, wheezing, and bronchitis. At this time OEHHA has not quantified short-term (acute) non-cancer health effects.

E. Health Risk Assessment for TRUs

This section examines the potential cancer health risks associated with exposure to diesel PM emissions from TRUs. Additional details on the methodology and assumptions used to estimate the health risks are presented in Appendix E of this report.

Risk assessment is a complex process that requires the analysis of many variables to simulate real-world situations. There are five key variables that can impact the results of a health risk assessment for the operation of diesel TRUs: 1) the amount of diesel PM emissions from the TRU engines operating at the facility, 2) the meteorological conditions which can affect the dispersion of diesel PM in the air, 3) the distance the receptor is from the emission source, 4) the duration of exposure to the diesel PM emissions, and 5) the inhalation rate of the receptor. Diesel PM emissions are a function of the total annual hours of TRU engine operations. Meteorological conditions can have a large impact on the resultant ambient concentrations of diesel PM with higher concentrations found along the predominant wind direction and under calm wind conditions. The meteorological conditions and proximity of the receptor to the source(s) of emissions affect the concentration of the diesel PM in the air where the receptor is located. In addition, the exposure duration and inhalation rates are key factors in determining potential risk, with longer exposure times and higher inhalation rates typically resulting in higher estimated risk levels. For this analysis staff assumed the 70

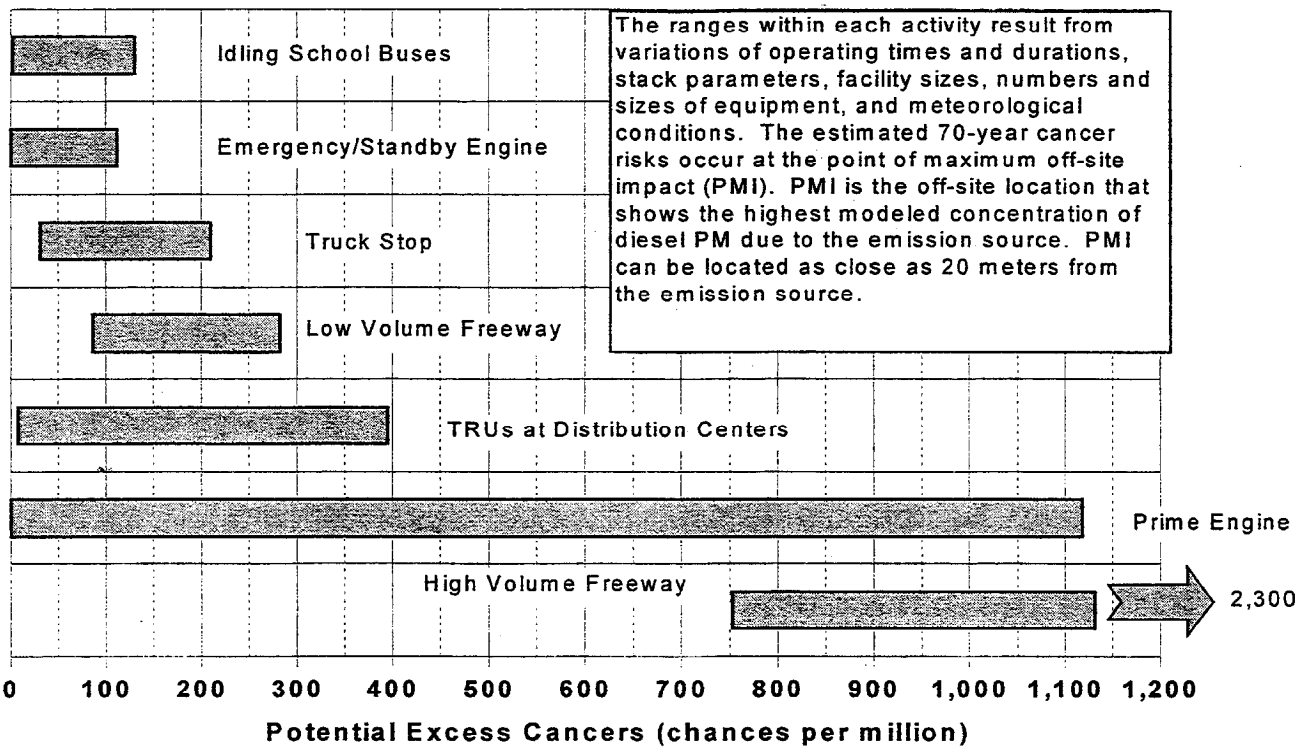
year exposure duration and inhalation rate recommended for estimating health impacts in the current OEHHA guidelines (OEHHA, 2003).

Because risk estimates for TRU operations are dependent on numerous factors and because these factors vary at each facility, ARB staff developed a generic (i.e. example) risk assessment for TRU facilities. Emission rates used in modeling were based on current average Statewide emission factors and anticipated lower emission standards coupled with the typical TRU engine size. Meteorological data from West Los Angeles was selected to evaluate meteorological conditions with lower wind speeds and more persistent wind directions, which will result in less pollutant dispersion and higher estimated ambient concentrations. Additionally, meteorological data for Sacramento, Oakland, and Pico Rivera were used to model health risk impacts to show the diversity of results due to meteorological conditions. Meteorological data from these areas encompass the range of meteorological conditions expected in California. The U.S. EPA ISCST3 air dispersion model was used to estimate the annual average diesel PM concentration from 100 meters to 1500 meters from the source.

Consistent with the current risk assessment methodology recommended by the OEHHA and used by ARB in evaluating potential cancer risk from diesel PM emission sources, we assumed that nearby receptors would be exposed to emissions for 70 years (OEHHA, 2003). This exposure duration represents an "upper-bound" of the possible exposure duration. The potential cancer risk was estimated by multiplying the modeled annual average concentrations of diesel PM adjusted for the duration of exposure.

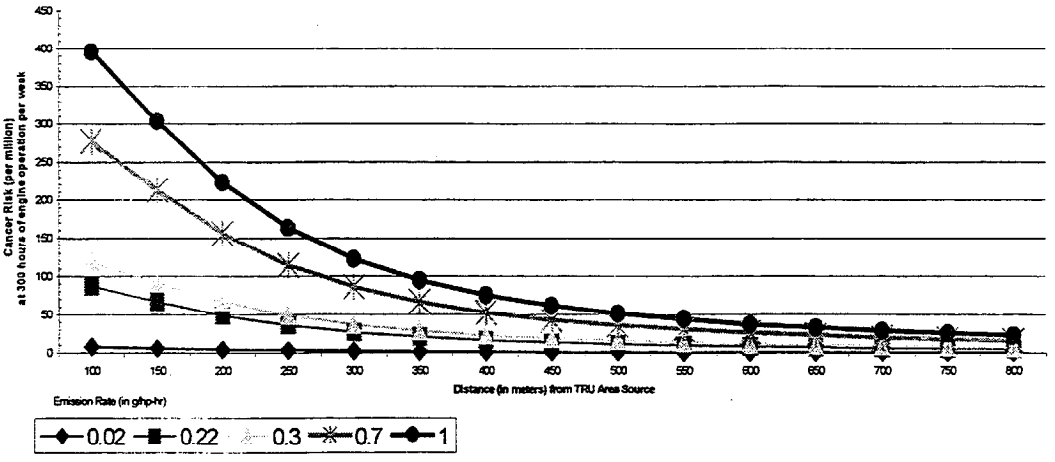
Based on our analysis under the conditions and assumptions outlined above, the estimated potential cancer risk due to emissions from diesel-fueled TRU engines ranged from approximately 8 to over 390 cancers per million. The low end in each case represents a very clean engine operating only a few hours annually, and the high end is an engine with a relatively high emission rate operating for many hours each year. As shown in Figure V-1, when compared to other activities using diesel-fueled engines, it can be concluded that diesel-fueled TRU engines could pose significant near-source risks to individuals living in close proximity to the engines. Figure V-2 shows potential cancer risks to nearby receptors due to 300 hours per week of TRU operations at various emission rates (1.0, 0.7, 0.3, 0.22, and 0.02 grams per horsepower-hour [g/hp-hr]).

Figure V-1: Potential Range of Cancer Risks due to Activities using Diesel-Fueled Engines



(Note: The risk ranges for the non-stationary engine scenarios, excluding the TRUs, are taken from the Diesel Risk Reduction Plan. The upper bounds have been adjusted to reflect the 95th percentile breathing rate. The upper bounds for the TRU engines are for 1.0 g/bhp-hr engines operating 600 hr/wk, 52 wk/yr.)

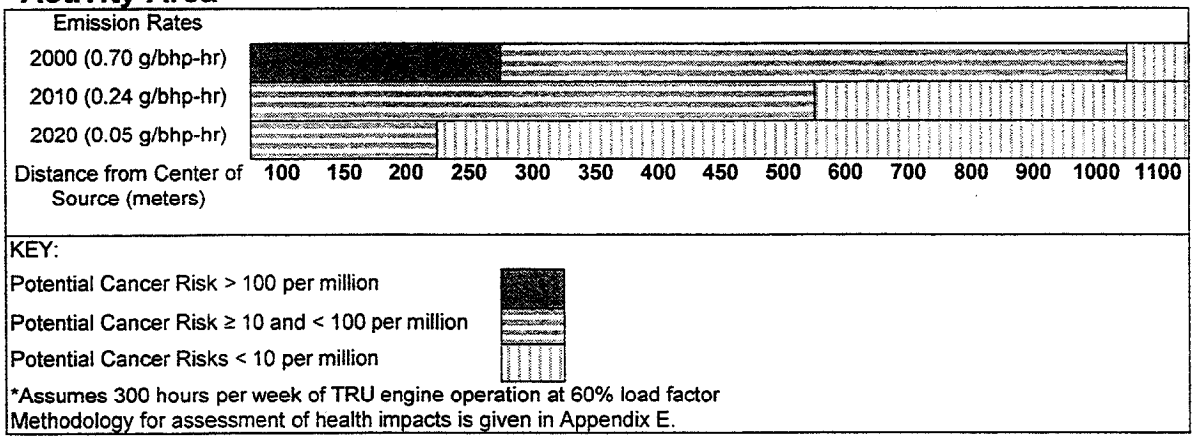
Figure V-2: Comparison of Potential Cancer Health Impacts for TRU Operations based on Particulate Emission Rates (West Los Angeles Meteorological Data)



The estimated potential cancer risk level presented here is based on a number of assumptions. The potential cancer risk for actual situations may be less than or greater than those presented here. For example, increasing the hours of TRU engine operations would increase the potential risk levels. Decreasing the exposure duration, or increasing the distance from the source to the receptor location would decrease the potential risk levels. The estimated risk levels would also decrease over time as lower-emitting diesel engines are used in TRUs. Therefore, the results presented are not directly applicable to any particular facility or operation. Rather, this information is intended to provide an indication as to the potential relative levels of risk that may be observed from TRU operations at facilities. All parameters and assumptions, along with the methodology for estimating these health risks are included in Appendix E.

Reduction of potential cancer risk levels at locations where TRUs operate is a direct result of the reduction of diesel PM emissions. Figure V-3 compared the cancer risk range at various distances assuming 300 hours of TRU activity per week. For year 2000, the current fleet average emission rate of 0.7 g/bhp-hr was used. As shown in Figure VII-2 in Chapter VII, taking into account the implementation of the TRU ATCM and the Tier 4 nonroad new engine emission standards, the average Statewide fleet emission rate would be reduced 65 percent to 0.24 g/bhp-hr in 2010. In 2020, the Statewide fleet PM emission rate would be reduced 92 percent from the 2000 baseline year to 0.05 g/bhp-hr. Figure V-3 below illustrates the significant reduction of the estimated near source risk as the diesel PM emission rate is reduced from the current fleet emission rate to the much lower emission rate in 2020.

Figure V-3: Estimated Risk Range versus Distance from Center of TRU Activity Area*



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VI. AVAILABILITY AND TECHNOLOGICAL FEASIBILITY OF CONTROL MEASURES

In this chapter of the staff report, we provide descriptions of particulate matter (PM) reduction emission control strategies currently available and projected to be available in the near future. We focus on those we believe may be employed to comply with the proposed Airborne Toxic Control Measure (ATCM). Additional information on the wide variety of emission reduction options for diesel fueled engines is provided in the Diesel Risk Reduction Plan (ARB, 2000). Unless otherwise noted herein, all references to Transport Refrigeration Units (TRU) include TRU generator sets. The term "facilities", as used herein, refers to facilities where TRUs operate, as defined in the regulation.

Diesel engines have long been the engines of choice for TRUs because of the efficiency and durability of diesel engines as well as the operators' familiarity with diesel engine technology. Alternative fueled engines have not been able to compete against the diesel engine for these very reasons. However, emerging technologies have potential for playing a part toward reducing diesel PM emissions.

A variety of diesel emission control strategies (DECS) can be used for controlling emissions from diesel engines, including aftertreatment hardware, fuel strategies, and engine modifications. Aftertreatment hardware could be add-on technologies such as diesel particulate filters (DPF) and diesel oxidation catalysts (DOC). Fuel strategies include alternative fuels, alternative diesel fuels, and fuel additives. Alternative fuels include, but are not limited to, compressed natural gas (CNG) and liquefied petroleum gas (LPG). An example of a fuel additive is a fuel borne catalyst. These technologies can be combined to form additional DECS. In addition, repowering with a cleaner diesel engine is a possible strategy.

Staff worked with emission control system manufacturers, TRU manufacturers, TRU engine manufacturers, and many other stakeholders to develop a *TRU Diesel PM Control Technology Option Matrix* (Matrix), which is included in Appendix B. The Matrix lists potentially viable compliance options. Included for each option is the potential PM and nitrogen oxide (NOx) control efficiency, an indication of known demonstrations of the technology in TRUs, cost information, an indication of its verification status, and any significant pros and/or cons that may be associated with its use. Footnotes in the Matrix in Appendix B indicate the source of the information.

In addition to requiring in-use TRUs to meet in-use performance standards in accordance with a compliance schedule, the proposed TRU ATCM also includes monitoring, recordkeeping, and reporting requirements for all TRU operators and applicable facilities. In recent years, there has been dramatic growth in the availability of automated equipment identification, tracking, and management systems that aid in the logistics of goods distribution. Such technologies could be adapted to help fleet owner/operators of TRUs and the facilities that attract refrigerated trucks, trailers, and containers to comply with the monitoring, recordkeeping and reporting requirements of

the proposed regulation. Relevant discussion is provided in the last section of this chapter.

A. Verification of Diesel Emission Control Strategies

As a way to thoroughly evaluate the emissions reduction capabilities and durability of a variety of DECS, the Air Resources Board (ARB or Board) has developed the *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines*[4] (Verification Procedure). The purpose of the Verification Procedure is to verify in-use strategies, which through the use of sound principles of science and engineering, control emissions of PM and NOx from diesel-fueled compression-ignition engines.

It should be noted that several of the technologies listed in the Matrix would not require verification (e.g. electric standby, cryogenic refrigeration, CNG, LPG and gasoline-powered engines, and fuel cells). Some of these technologies may need to meet other emission standards (e.g. Large Spark-Ignited Engine Standards). Currently, none of the technologies listed in the Matrix requiring verification have been verified for use on TRU engines. A complete and up-to-date list of verified DECS and the engine families for which they have been verified, along with letters of verification, may be found on the ARB web site: http://www.arb.ca.gov/diesel/verifieddevices/verdev.htm.

In addition to the information included in the Matrix shown in Appendix B, general descriptions of some of the technologies are provided below.

B. Passive Diesel Particulate Filters

In general, a DPF consists of a porous substrate that permits gases in the exhaust to pass through but traps the PM in the exhaust. DPFs are very efficient in reducing PM emissions, achieving typical PM reductions in excess of 90 percent. Most DPFs employ some means to periodically regenerate the filter (i.e., burn off the accumulated PM). These can be divided into two types of systems, passive and active.

A passive catalyzed DPF reduces PM, carbon monoxide (CO) and hydrocarbon (HC) emissions through catalytic oxidation and filtration. Most of the DPFs sold in the United States use substrates consisting of ceramic wall-flow monoliths to capture the diesel particulates. Some manufacturers offer silicon carbide or other metallic substrates, but these are less commonly used in the United States. These wall-flow monoliths are either coated with a catalyst material, typically a platinum group metal, or a separate catalyst is installed upstream of the particulate filter. The filter is positioned in the exhaust stream to trap or collect a significant fraction of the particulate emissions while allowing the exhaust gases to pass through the system.

[4] Approved by the Board in May 2002. Sections 2700 through 2710, Title 13, California Code of Regulations.

Effective operation of a DPF requires a balance between PM collection and PM oxidation, or regeneration. Regeneration is accomplished by either raising the exhaust gas temperature or by lowering the PM ignition temperature through the use of a catalyst. The type of filter technology that uses a catalyst to lower the PM ignition temperature is termed a passive DPF, because no outside source of energy or intervention is required for regeneration. A passive DPF is a very attractive means of reducing diesel PM emissions because of the combination of high reductions in PM emissions and minimal operation and maintenance requirements.

Passive DPFs have been successfully used in numerous applications. In the last 10 years, over 10,000 filter systems have been retrofitted on trucks and buses worldwide. Internationally, retrofit programs exist in Sweden, Germany, Switzerland, Hong Kong, Taiwan, London, Paris, Mexico City, and Tokyo (MECA, 2003). In the United States, the use of DPFs is growing more common, with DPF retrofit programs underway in California, New York, and Texas. In California, diesel-fueled school buses, solid waste collection vehicles, urban transit buses, medium-duty delivery vehicles, people movers, and fuel tanker trucks have been retrofitted with DPFs through various demonstration programs. The TRU application may be more difficult than those cited above due to engines running at lower loads. This results in lower exhaust temperatures, making passive regeneration less reliable, especially in the winter when refrigeration loads (and thus engine loads) are even lower (Yanmar, 2002). Since TRUs are used to refrigerate perishable goods, reliability is essential to perishable goods safety.

C. Active Diesel Particulate Filters

An active DPF system uses an external source of heat to oxidize the PM or an intake air throttle to reduce intake air and increase the exhaust temperature. The most common methods of generating additional heat for oxidation involve electrical regeneration by passing a current through the filter medium, injecting fuel to provide additional heat for particle oxidation, or adding a fuel-borne catalyst or other reagent to initiate regeneration. Microwave energy can also be used to regenerate the filter (Nixdorf, 2003). Use of an intake throttle momentarily reduces the amount of excess air, so the exhaust temperature rises as a result of not having to heat the excess air (Mayer, 2003). Some active DPFs induce regeneration automatically on-board the vehicle or equipment when a specified backpressure is reached. Others use an indicator, such as a warning light, to alert the operator that regeneration is needed, and require the operator to initiate the regeneration process. Some active systems collect and store diesel PM over the course of a full shift and are regenerated at the end of the shift with the vehicle or equipment shut off. A number of the filters are removed and regenerated externally at a regeneration station.

For applications in which the engine-out PM is relatively high, and the exhaust temperature is relatively cool, active regenerating systems may be more effective than a passive DPF (Zelenka, 2001). Because active DPFs are not dependent on the heat carried in the exhaust for regeneration, they potentially have a broader range of application than passive DPFs (Mayer, 2001). Active DPFs have been used

successfully in Europe since the early 1990's (Zelenka, 2002). However, staff is unaware of any completed demonstrations of active DPFs with TRU engines.

D. Flow-Through Filters

Flow-through filter (FTF) technology is a relatively new method for reducing diesel PM emissions. Unlike a DPF, in which only gases can pass through the substrate, the FTF does not physically "trap" and accumulate PM. Instead, exhaust flows through a medium (such as a wire mesh) that has a high density of torturous flow channels, thus giving rise to turbulent flow conditions. The medium is typically treated with an oxidizing catalyst that is able to reduce emissions of PM, HC, and CO, or used in conjunction with a fuel-borne catalyst. Any particles that are not oxidized within the FTF flow out with the rest of the exhaust and do not accumulate. Consequently, the filtration efficiency of an FTF is lower than that of a DPF, but the FTF is much less likely to plug under unfavorable conditions, such as high PM emissions and low exhaust temperatures (Brück, 2001). The FTF, therefore, is a candidate for use in applications unsuitable for DPFs.

Staff expects that a catalyzed FTF will achieve between 30 and 60 percent PM reduction, lower than a DPF, for a Level 1 or 2 verification. Relative to a DOC, which typically has straight flow passages and laminar flow conditions, the FTF achieves a greater PM reduction owing to enhanced contact of PM with catalytic surfaces and longer residence times. The better performance of an FTF when compared to a DOC may come at the cost of increased backpressure. Capital costs of an FTF will likely be between $1,500 and $2000 (Valentine, 2003).

E. Diesel Oxidation Catalyst

A DOC reduces emissions of CO, HC, and the soluble organic fraction of diesel PM through catalytic oxidation alone. Exhaust gases are not filtered, as with the DPF. In the presence of a catalyst material and oxygen, CO, HC, and the soluble organic fraction undergo a chemical reaction and are converted into carbon dioxide and water. Some manufacturers integrate HC traps (zeolites) and sulfate suppressants into their oxidation catalysts. HC traps enhance HC reduction efficiency at lower exhaust temperatures and sulfate suppressants minimize the generation of sulfates at higher exhaust temperatures (DieselNet, 2002). A DOC can reduce total PM emissions up to 30 percent. PM emission reductions at this higher end are typically associated with engines that emit "wet" PM (i.e. particles that have a higher percentage of soluble organic fraction (SOF) adsorbed onto the particle surface). Older engines or engines that have less efficient fuel combustion typically produce PM with a higher SOF adsorbed onto the elemental carbon. Engines that more efficiently combust the fuel would have less SOF adsorbed onto the elemental carbon, so the PM emission reductions would be less on a percentage basis.

This technology is commercially available and devices have been installed in over 20,000 buses and highway trucks in the U.S. and Europe (MECA, 2003). As a result of

the United States Environmental Protection Agency (U.S. EPA) Urban Bus Retrofit/Rebuild program, several models have been certified by the U.S. EPA and through the ARB aftermarket parts certification program. Nationwide, thousands of DOCs are installed on urban transit buses with engines older than 1994 model years.

In general, DOCs function well on all vehicle and equipment types. ARB has begun a demonstration to explore the applicability of DOCs on older, higher emitting solid waste collection vehicles. Only one known proof of concept test has been conducted on a TRU engine.

F. Fuel Additives

A fuel additive is a DECS when it is designed to be added to fuel or fuel systems so that it is present in-cylinder during combustion and its addition causes a reduction in exhaust emissions. Additives can reduce the total mass of PM, with variable effects on CO, NOx and gaseous HC production. An additive added to diesel fuel in order to aid in soot removal by decreasing the ignition temperature of the carbonaceous exhaust is often called a fuel borne catalyst (FBC). PM emission reductions of up to 25 percent have been measured for FBCs alone (Valentine, 2000).

FBCs used in conjunction with DOCs have resulted in PM emission reductions of 50 percent and when used with both passive and active filter systems to improve fuel economy, aid system performance, and decrease mass PM emissions in excess of 95 percent (Valentine, 2000). FBC/DPF systems are in wide spread use in Europe in both on-road and off-road, mobile and stationary applications and typically achieve a minimum of 85 percent reduction in PM emissions. Additives based on cerium, platinum, iron, and strontium are currently available, or may become available for use in the future in California (DieselNet, 2003).

Cerium based additives are in wide spread use in Europe and are VERT-approved when used with DPFs. VERT is a Swiss project for curtailing emissions from diesel engines in tunnel construction. A cerium-based additive is part of Peugeot's new passenger car filter-based system and, in addition to on-road applications, cerium additives are used off-road in construction and forklift applications (DieselNet, 2003).

Platinum-Cerium FBC mixtures at 4 to 8 parts per million have been demonstrated on a fleet of 100 grocery distribution TRUs using Clean Diesel Technologies Platinum Plus DFX™. PM emission reductions were estimated to be 10 to 25 percent (Valentine, 2002).

G. Alternative Diesel Fuels

An alternative diesel fuel is a fuel that is not just a reformulated diesel fuel and can be used in a diesel engine without modification to the engine (although minor modifications may enhance performance). This definition of alternative diesel fuels includes

emulsified fuels, biodiesel fuels, and Fischer-Tropsch (F-T) fuels. The emissions effects of these fuels can vary widely.

Before any alternative fuel can be used to comply with a diesel PM control measure, it would have to be verified through the Verification Procedure, which includes a special section (CCR, title 13, §2710) that deals specifically with these fuels. No alternative diesel fuels are currently verified by ARB under the Verification Procedure.

Note: It should be noted that in order to qualify as an ultra-low emission TRU compliance option (see Chapter VII), an alternative diesel fuel must not contain any conventional diesel fuel. Specifically, emulsified diesel fuels would not qualify, and biodiesel and F-T fuels must be used in the "neat" form (100 percent biodiesel or F-T).

Water Emulsion Diesel Fuels

A demonstrated alternative diesel fuel that reduces both PM and NOx emissions is an emulsion of diesel fuel and water. The process mixes water with diesel and adds an agent to keep the fuel and water from separating. The water is suspended in droplets within the fuel, creating a cooling effect in the combustion chamber that decreases NOx emissions. A fuel-water emulsion creates a leaner fuel environment in the engine, thus lowering PM emissions. The major manufacturer of this fuel-water emulsion is Lubrizol Corporation, which produces PuriNOx™ (U.S. EPA, 2002a).

According to data submitted for the ARB fuels certification procedure, PuriNOx™, achieved a 14 percent reduction in NOx emissions and a 63 percent reduction in PM emissions, based on tests on one engine (ARB, 2001). Similar results were found in a U.S. EPA analysis. According to U.S. EPA's analysis of available literature, a medium to heavy heavy-duty vehicle may achieve between a 51 and 58 percent reduction in PM in conjunction with a 10 to 13 percent reduction in NOx emissions (U.S. EPA, 2002a).

PuriNOx™ has been used in a variety of vehicles, including construction equipment and transit buses, but not on TRUs to date. The California Department of Transportation has experience with this fuel. They found that engines did not require engine modifications. But, fuel filters plugged more frequently at the initial conversion and required removal, bypass, or change of filters that were equipped with water separators. The emulsion does tend to break down and separation occurs when stored for over 30 days without agitation or fuel turn over. There are also cold weather compatibility issues (Heiner, 2003). Several companies operating at the Port of Los Angeles are also using PuriNOx™.

Note: It should be noted that water emulsion diesel fuels could not be used to qualify as an ultra-low emission TRU compliance option under the TRU ATCM (see Chapter VII) since conventional diesel fuel is a component. However, it could qualify as a Level 2 verified DECS since PM emission reductions exceed 50 percent, but would have to be verified under the Verification Procedure before it could be used as a compliance option.

Biodiesel

Biodiesel is a mono-alkyl ester-based oxygenated fuel, a fuel made from vegetable oils, such as oilseed plants or used vegetable oil, or animal fats. It has similar properties to petroleum-based diesel fuel, and can be blended into petroleum-based diesel fuel at any ratio. Biodiesel is most commonly blended into petroleum-based diesel fuel at 20 percent, and called B20. Pure biodiesel is called B100 or "neat" biodiesel.

Using publicly available data, the U.S. EPA recently analyzed the impacts of biodiesel on exhaust emissions from heavy-duty on-road engines (U.S. EPA, 2002b). While biodiesel and biodiesel blends reduce PM, HC, and CO emissions, NOx emissions increase, depending on the biodiesel to diesel fuel blend ratio. As the proportion of biodiesel increases, the PM, HC, and CO emissions decrease while the NOx emissions increase. Table VI-1 shows the average biodiesel emissions compared to emissions for conventional diesel.

Table VI-1
Average Biodiesel Emissions Compared to Conventional Diesel Emissions

Pollutant	B100	B20
Hydrocarbons	-67%	-20%
Carbon Monoxide	-48%	-12%
Particulate Matter	-47%	-12%
Nitrogen Oxides	+12%	+2%

In addition, the U.S. EPA states a B20 blend is predicted to reduce fuel economy by one to two percent. The data were qualified with conclusions that the impact of biodiesel on emissions varied depending on the type of feedstock (soybean, rapeseed, or animal fats) and the quality of the diesel fuel used in biodiesel blends. Biodiesel made from animal fats has the smallest NOx increase (3 percent for animal-based compared to 16 percent for soybean-based for B100).

Biodiesel has been used successfully in heavy-duty diesel-fueled vehicles. However, tests conducted by ThermoKing on TRU engines were not as encouraging. Severe injector tip deposits, head and piston deposits, stuck and broken rings, oil pan deposits, and lubricating oil dilution were just some of the problems encountered (Sem, 2003a). Further testing is planned to investigate the causes.

Biodiesel also costs more than conventional diesel fuel. Table VI-2 provides pricing data from the Energy Management Institutes Alternative Fuels Index, a weekly benchmark for alternative fuels (EMI, 2003).

Table VI-2
Price Comparisons – B100 Biodiesel to Conventional Diesel

City	B100	#2 Diesel	Incremental Difference
L.A.	$2.09	$0.97	$1.12
San Francisco	$2.00	$0.98	$1.02
National Average	$2.06	$0.85	$1.21

Prices shown in the above table exclude tax and delivery.

As discussed earlier, in order to qualify as an ultra-low emission TRU compliance option (see Chapter VII), biodiesel would qualify only if used in the "neat" form (100 percent biodiesel).

Fischer-Tropsch Synthetic Diesel Fuel

In the TRU ATCM, F-T fuels fall under the definition of "Ultra-Low-Aromatic Synthetic Diesel Fuel," which means fuel produced from natural gas, coal, or biomass by the Fischer-Tropsch gas-to-liquid chemical conversion process, or similar process. Such a fuel must meet the following properties listed in Table VI-3:

Table VI-3
Fischer-Tropsch Fuel Properties

Property	ASTM	Value
Sulfur Content (ppmw)	D5453-93	<1
Total Aromatic Content (wt %)	D5186-96	<1.5%
Polynuclear Aromatic Content (wt %)	D5186-96	<0.5%
Natural Cetane Number	D613-84	>74

These properties make this fuel very attractive from a diesel emissions reduction standpoint. Table VI-4 shows the emission reductions for F-T synthetic fuel compared to California diesel fuel (CEC, 2000).

Table VI-4
Fischer-Tropsch Emission Reductions

Pollutant	F-T Emission Reductions
PM	30%
NMHC	23%
NOx	5%
CO	39%

No engine modifications are required and F-T fuel appears to be compatible with exhaust aftertreatment devices. However, there may be cold weather compatibility issues since highly n-paraffinic F-T diesel begins to gel at 34 °F (Heiner, 2003). Changes in processing conditions may improve the cold-flow characteristics, but additives don't help for "neat" F-T diesel (McCormick, 2003).

The availability of F-T diesel fuel may limit its use, at least in the short-term. Current sources of F-T diesel fuel are not domestic, with two major plants in South Africa and one in Malasia (Yakobson, 2003). But since the late-1990s, every major oil company has announced plans to build pilot plants or commercial plants to produce F-T fuel, improving the potential role this fuel could play in reducing diesel engine exhaust emissions. There will be 10 large-scale F-T diesel fuel plants by 2020 producing about 2.5 percent of the world diesel demand – enough to fill the U.S. West Coast demand for diesel fuel (Davies, 2003).

The cost of F-T fuel is 15 to 25 cents more per gallon than California diesel fuel. There is a two to three percent fuel penalty due to reduced energy content (Yowell, 2001), but the power loss is not noticeable (Heiner, 2003).

H. Alternative Fuels

Conventional diesel engines are internal combustion, compression-ignition engines. In contrast, engines that operate on an alternative fuel, such as CNG, liquefied natural gas (LNG), and LPG, are usually spark-ignited. The exception is dual-fueled pilot-ignition engines. Engines certified to operate on alternative fuels produce substantially lower PM and NOx emissions than diesel-fueled engines not equipped with exhaust aftertreatment. CNG-fueled TRU engines have been demonstrated, but are currently not currently in demand (Sem, 2001). LPG-fueled TRU engines have been under development, but have never made it to the demonstration phase due to lack of customer interest. Fuel tank weight, operating range, infrastructure costs, and the cost of meeting the Large Spark-Ignition Engine emission standards cause the lack of demand for further development.

Dual-Fuel Pilot-Injection CNG/LPG Fumigation

A dual-fuel pilot ignition engine is a compression-ignition engine that operates on natural gas or propane but uses diesel as a pilot ignition source. The total use of diesel is around six percent of the fuel consumed. ARB has defined this engine in its proposed TRU ATCM as an engine that uses diesel fuel at a ratio of no more than one part diesel fuel to ten parts total fuel on an energy equivalent basis. Furthermore, the engine cannot idle or operate solely on diesel fuel at any time. A TRU engine that meets this definition and is verified under the Verification Procedure would be classified as an alternative-fuel engine, and would qualify as an ultra-low emission TRU (see Chapter VII) under this TRU ATCM.

Thermoking and Woodward Governor have tested a proof-of-concept CNG dual-fuel pilot injection design. They have indicated they plan to develop a commercial version for both CNG and LPG that would be verified under the Verification Procedure. This technology could be used for both retrofit and on new engines (Sem, 2001).

I. New Engines – for Repower or in Original Equipment

The "interim" Tier 4 particulate emission standards proposed by U.S. EPA will take effect nationally and in California beginning with model year (MY) 2008 for engine manufacturers that opt to meet the "interim" standards, and MY 2013 for "long term" Tier 4. Manufacturers that don't opt to meet the "interim" standards would be required to comply in 2012 with the "long term" standards. Because the devices used to meet the more stringent 2013 standards for greater than or equal to (≥) 25 hp engines are made less efficient by sulfur in the exhaust stream, the level of sulfur in vehicular diesel fuel will also be reduced by 90 percent, relative to current California diesel fuel sulfur levels, to less than (<) 15 ppmw. This is required by mid-2006 (13 CCR, §2281). The <15 ppm sulfur limits will also apply to nonvehicular diesel fuel, effective September 1, 2006.

As discussed in the Requirements section of Chapter VII, new MY 2008 through MY 2012 engines certified to meet the "interim" Tier 4 nonroad diesel engine standards will meet the low emission TRU in-use performance standards for all TRU engines (see Chapter VII). Similarly, MY 2013 and subsequent MY engines that are certified to meet the "long term" Tier 4 standards would meet the ultra-low emission TRU in-use performance standards (see Chapter VII) for ≥ 25 hp TRU engines. This would not be true for <25 hp TRU engines because there is no engine certification value for the ultra-low emission TRU in-use performance standard included in the proposal.

Repowering TRUs with these engines according to the compliance schedule is one option. However, there may be some engine compatibility problems with this approach due to dimensional/spatial and electrical differences. New Tier 2 engines (2004 and beyond) would not be compatible with pre-Tier 2 engines for a significant number of models. This option is non-viable for many greater than (>) 25 hp TRU models and most, if not all, <25 hp TRU models (straight truck TRUs) (Sem, 2003b; Guzman, 2003).

TRU replacement though could be an option if engine repowering is not possible. Replacing older TRUs powered by TRU engines that do not comply with the in-use performance standards with new TRUs (original equipment) that are powered with engines that comply with the new engine standards is also a compliance option that would be available to operators.

J. Electric Standby

TRU manufacturers currently offer electric standby (E/S) as an option for most truck TRU models, but relatively few trailer TRU models offer this. E/S-equipped TRUs allow the TRU engine to be shut off when a compatible power supply is available at a facility so TRU diesel engine emissions are eliminated. As currently designed, however, the electric motors used for E/S are only sized to hold a temperature set point (Guzman, 2002a). The motors do not have sufficient power to be used to pre-cool the transport van enclosure in a reasonable amount of time prior to loading (Guzman, 2002b; Sem, 2002b). That said, in Europe, 40 to 50 percent of the trailer TRUs are equipped with E/S, but the trailer vans are shorter there due to tighter maneuvering needs (Sem,

2002b). Increasing the power rating of the electric motors used in E/S would require significant redesign due to space and structural limitations.

There are also electric power infrastructure compatibility issues. Most E/S units are designed to use three-phase power, which is available at most new facilities, but older facilities (typically small facilities) may have only single-phase power available. Also, there are a number of three-phase voltages used at facilities (e.g. 240, 408, 430, 440, and 480 volt). Plug compatibility can be an issue since there are dozens of plug configurations available for three-phase connections. There are also safety concerns with plugging into a high voltage power source and with "drive-offs" (drivers failing to disconnect before driving away).

The cost of the E/S option adds $2,000 to $2,600 to the cost of a trailer TRU and $350 to $600 to a truck TRU. Adding the power infrastructure at the facilities where TRUs operate is expensive. Loading door outlets cost about $1,250 each if no transformer upgrades are necessary. With transformer upgrades, the cost goes up to $5,000 per outlet for 480 volt and $7,000 per outlet for 208 volt (Warf, 2002). For power outlets in the parking areas, the costs go up significantly due to trenching costs (Joffee, 2002).

In addition, no attempts to retrofit an E/S to units that are not factory-equipped are known to have been completed. Previous interest in retrofitting has been blunted by cost estimates that were prohibitively high – $6,000 to $8,000 (Guzman, 2002b). However, the E/S retrofit approach is now being evaluated very closely in a demonstration project funded with Congestion Mitigation Air Quality, the South Coast Air Quality Management District Technology Advancement Office, and Carl Moyer Program funds. About 30 TRUs will be retrofit and loading dock power will be added at a distribution facility.

Currently, only 0.5 to three percent of trailer TRUs and 40 to 80 percent of truck TRUs are equipped with E/S, according to ThermoKing and Carrier. Captive fleets and grocery distribution centers that own the TRUs they operate are the most likely to have trailer TRUs equipped with E/S. For-hire carriers are reluctant to pay the extra cost to buy the E/S option because there are very few facilities equipped to provide electric power. Furthermore, facilities are reluctant to add power plug-ins because few carriers have the E/S option and they don't want to pay for the electric power for carriers bringing goods in.

IdleAire Technologies Corporation may help break this stalemate syndrome with the Phase 2 Advanced Truck/Trailer Electrification Technology which provides power, communications, cab air conditioning and other services designed to eliminate truck idling, and TRU engine operations at truck stops. Ten truck stops are currently operating this technology across the U.S. with another dozen under construction. Four are currently operating in California. About 150 truck stops are currently under agreement to add this technology across the country, 12 of which are in California (IdleAire, 2003).

Hybrid Electric TRU

Recently, Carrier Transicold announced the use of a hybrid electric TRU design in the continental U.S. The diesel engine drives a generator that, in turn, powers an electric semi-hermetic refrigeration compressor and electrically driven fans, all controlled by an advanced microprocessor. The design eliminates many parts that require maintenance, repair, or replacement, thereby reducing maintenance costs and improving reliability. Belts, idlers, clutches, compressor shaft seals, solenoid valves, and vibration isolators are eliminated. This hybrid electric TRU is easily adaptable to run on electric grid power when at a facility, so that diesel engine operation is eliminated.

This hybrid design is currently marketed in Europe. Carrier representatives indicate the cost is higher than a traditional TRU, but costs less than it would to retrofit a traditional TRU with an electric standby system. One big advantage is that the hybrid design provides full unit refrigeration capacity in standby mode. Carrier also maintains the hybrid design is adaptable for future use with fuel cell technology (Murdock, 2003).

K. Cryogenic Temperature Control Systems

Cryogenic Temperature Control Systems heat and cool using a cryogen, such as liquid carbon dioxide or liquid nitrogen that is routed through an evaporator coil that cools air blown over the coil. The ThermoKing cryogenic system uses a vapor motor to drive a fan and alternator, and a propane-fired heater superheats the carbon dioxide for heating and defrosting. Since there is no diesel engine, TRU engine emissions are eliminated. Refrigerated vans that use "pure" cryogenic systems would not fall under applicability of this regulation.

Capital costs for these types of systems are about 10 percent higher than a diesel TRU (Geisen, 2002), but the facility infrastructure costs for cryogenic fuel adds to the capital cost. And, operating costs for liquid carbon dioxide are typically about double the diesel fuel-operating costs and go up with the distance from the source. Carbon dioxide is readily available near oil refineries because it is a byproduct of the refining process.

These systems are being marketed in Europe and the U.S. There have been several demonstrations in the U.S. – one in Chicago and one in Southern California (Viegas, 2003).

Care must be taken to ensure cryogenic systems are not used in applications that are unsuitable for the technology. An evaluation of operating practices and equipment use may reveal logistical improvements would be necessary for successful application. Several key considerations follow:

- Proximity of distribution center to sources of cryogenic "fuel" affects operating costs
- Loads should be pre-cooled to set-point prior to loading, to conserve cryogenic "fuel"
- Loading warm return crates uses more cryogenic "fuel," reducing distribution range
- Multiple door opening delivery routes should use door curtains to conserve cryogen
- Long delivery runs may exceed on-board cryogen capacity
- Poor or deteriorated insulation and door seals increase cryogen use and decrease range
- Mixed temperature loads can be problematic for units designed for single temp

Operator willingness to improve logistical operating practices may be the key to compatible application of this technology.

L. Fuel Cells

Compared to a conventional diesel-powered TRU, fuel cell TRUs would offer zero or near-zero emissions (e.g. smog-forming and diesel PM) and lower greenhouse gas emissions. A fuel cell using pure hydrogen produces no pollution. However, the production of hydrogen gas for use in fuel cells is expected to result in extremely low air pollution emissions. Fuel cells are currently being developed by many auto manufacturers, and have generated interest and enthusiasm among industry, environmentalists, and consumers for other types of applications.

At this time, there are no fuel cells appropriately sized for use on a TRU, but electrically-driven TRUs could be powered by fuel cells on or off the road (e.g. at a facility). Another possible approach is a hybrid, with a fuel cell providing electric power to the TRU equipped with electric drive while operating at a facility and a diesel engine powering the TRU while operating in remote areas. The size and weight of the fuel cell and fuel may be a limitation. The University of California, Davis, Institute of Transportation Studies is exploring this concept. Red Coat International (Wilhelm, 2003) and General Hydrogen (Sokoloski, 2003) have also expressed intent to develop fuel cells for TRU applications.

M. Technology Combinations

A trend in technologies presented to ARB for verification is for applicants to combine more than one technology to maximize the amount of diesel PM reduction. This section discusses some of these combinations, including technologies not yet verified.

Fuel Borne Catalyst plus Hardware Combinations

A FBC can be combined with any of the three hardware technologies discussed above (e.g. DPF, DOC, or FTF). Although no combination system using an FBC has been verified yet for TRUs, Clean Diesel Technologies has reported to ARB staff that an application has been submitted to verify a FBC plus catalyzed wire mesh filter (a type of flow-through filter). Emission reduction claims are as follows: 65 percent PM, 75 percent hydrocarbon and carbon monoxide, and five percent NOx using ultra-low sulfur

diesel fuel. This combination would cost between $1,500 and $2,000, could be installed in about two hours, and would add from $0.06 to $0.13 per gallon for the FBC additive. The dosing system for the fuel delivery truck or fueling station would cost between $150 and $350, which would be spread out over a number of units being fueled (Valentine, 2003).

The combination of an FBC with a DPF functions similarly to a catalyzed DPF, but an FBC allows the DPF to be lightly catalyzed. The FBC enhances DPF regeneration by encouraging better contact between the PM and the catalyst material during the in-cylinder combustion and exhaust processes. The FBC plus DPF combination reduces both the carbonaceous and soluble organic fractions of diesel PM. The primary benefit of this combination is a reduction in the amount of NO_2 generated as a proportion of NOx.

Hybrid Cryogenic Temperature Control Systems

Hybrid Cryogenic Temperature Control Systems use a cryogenic temperature control system in conjunction with a diesel engine. The hybrid cryogenic systems currently offered by ThermoKing are designed to provide a very high cooling capacity to recover from door openings on loads of perishable products that are very sensitive to temperature drops (e.g. ice cream). It may be possible to use a hybrid cryogenic system to eliminate engine operation at a facility, resorting to engine operation while on the road.

N. Demonstrations

Some of the technologies listed in the Matrix (Appendix B) have been demonstrated in TRU engines. The degree of success has been mixed, but ARB staff believes that there is sufficient time before compliance dates to develop the more viable options into reliable commercial products.

In addition, staff has worked with emission control system (ECS) manufacturers to generate interest in the TRU application. Staff has provided information and introduced the ECS manufacturers to the TRU manufacturers and the TRU engine manufacturers. Some of this effort has lead to ECS development efforts and demonstrations on TRUs.

For example, TTM's Andreas Mayer, of Switzerland, has been working with ThermoKing and several other European companies to test a number of active regenerating strategies for TRU engines, including hydrocarbon injection onto the face of a catalyst, heatable oxidizing catalyst, and intake throttle. Negotiations are in progress with a California partner who would shepherd the commercial system through the Verification Procedure, and provide marketing, installation, and customer support. A California fleet has expressed interest in participating in this demonstration.

O. International Experiences

In 2000, the ARB established the International Diesel Retrofit Advisory Committee, which met six times from 2000 through 2002, to provide ARB with technical information regarding retrofitting diesel engines. In addition to technical experts in the United States, ARB invited knowledgeable persons from countries in Europe and Asia with diesel vehicle retrofit programs to join the group.

P. Technology Reviews

Although there may be many feasible technology options that are being developed or that could be developed, none have been verified to date under the Verification Procedure and it would be difficult, if not impossible to predict when this may occur. Therefore, staff is proposing that two technology reviews be conducted to assure reliable, cost-effective compliance options are available in time for implementation.

The first technology review would be in late 2007, a year prior to the first in-use compliance date, which would be December 31, 2008. Staff would thoroughly evaluate progress made toward applying advanced technologies to meet the in-use performance standards required for TRU engines in the proposed ATCM. Part of this technology review would also look ahead to the 2013 "long term" nonroad engine standard for PM for <25 hp engines to determine if a more stringent level would be feasible. As discussed above, EPA's May 23, 2003 Notice of Proposed Rulemaking for nonroad diesel engine standards did not include a "long term" PM standard for <25 hp diesel engines. But the EPA proposal did include a recommendation for a technology review in 2007 to evaluate technologies for <25 hp engines and to evaluate whether a more stringent "long term" standards would be feasible. ARB staff is proposing a technology review that would be conducted in conjunction with the U.S. EPA technology review.

The second technology review would be in 2009 and would evaluate whether verified PM emission control technology is available and cost-effective for a broad spectrum of TRUs to meet the ULETRU in-use performance standards (see Chapter VII) that would go into effect from 2010 through 2012. If technologies are found to be available and cost-effective, then the ULETRU in-use performance standard would be retained.

Q. Automated Equipment Identification and Recordkeeping

In recent years, the availability of automated equipment identification, tracking, and management systems has increased dramatically. Such technologies could be used to help fleet owner/operators of TRUs, and applicable facilities to comply with the requirements of the proposed regulation. An example of this type of application is the use of global positioning systems (GPS) data to compile required fuel tax and mileage trip reports for the Department of Transportation. Transportation Service LLP's software collects the GPS data and prepares the report, making the process easier, faster, more accurate and more economical than collecting and auditing paper copies of driver trip reports (Refrigerated Transporter, 2003b).

The record keeping and reporting requirements of the proposed ATCM are described in more detail in Chapter VII. In short, all in-use TRUs operating in California would required to meet in-use performance standards in accordance with a compliance schedule. This would entail replacing old engines with new engines or installing a verified DECS that meets the appropriate in-use performance standard. Alternative technologies could also be used as an optional compliance path. To qualify, these alternative technologies either eliminate the emissions of diesel PM or eliminate the operation of the TRU engine while the TRU is at a facility. Verifying compliance in this regard would be essential from the TRU operator's perspective, which is where this new technology may come into play.

In addition, staff have surveyed TRU operators and facilities and found that the amount of time TRU engines operate at a facility as opposed to total engine run time is not currently monitored. The proposed regulation would require facilities to monitor and report the annual amount of time TRU engines operate while at the facility and in total (e.g. on the road and at facility). This operating activity data would provide a measure of the TRU engine emissions while at a facility and in total, and could be used to evaluate public health risk near these facilities and improve the accuracy of statewide emissions.

The facility monitoring and reporting requirement would apply to the TRU engines associated with hauling inbound goods and outbound goods. Most TRUs are equipped with engine-hour meters that monitor the engine run time for scheduled preventive maintenance. But simply monitoring total annual engine run time would not be appropriate since this would not provide an indication of the engine emissions while at a facility. Staff envision the need for facilities to monitor the date and time that refrigerated trucks, trailers, and containers enter and leave a facility, as well as the hour meter reading at each of these events. Comparing the entry and exit hour meter readings would provide the engine run time while at the facility.

Technologies may exist, or could be modified or developed, that could automate this work. Many newer TRUs are equipped with data acquisition systems that provide TRU switch-on time and refrigeration system performance information related to food safety. As an augmentation of this existing capability, automated equipment identification and information management technology could be integrated with the data acquisition systems. ThermoKing offers GPS tracking systems capable of locating TRUs within a few yards. And, Trimble Navigation LTD offers real time asset tracking and monitoring, using a transmitter attached to the microprocessor or datalogger to pass information to a base station receiver. A standard personal computer picks up the information and processes it with special software (Refrigerated Transporter, 2002).

Other existing technologies could also be applied. Each TRU could be equipped with a transponder or other means of quick identification. Transponders could be set to transmit identification information and coded data when activated by a radio frequency signal from an "interrogator" or "reader" when a refrigerated truck, trailer, or container

entered and left an affected facility. The transponder would reflect part of the RF signal back to an antenna, communicating a code that identifies the unit, whether and how it complies with in-use performance standards, and the hour meter reading. The readers would provide input to a computer.

For compliance strategies that rely on a certain mode of operation while a TRU is at a facility and a different mode while the TRU is away from a facility (e.g. electric standby, cryogenic cooling, and advanced technologies), the transponder code would indicate the compliance strategy used on either side of a "virtual facility fence line". In this case, GPS and other automated data collection devices would be used to show TRU location with respect to the fence line and status of compliance. Compliance reports could be generated automatically by a computer and sent to ARB on schedule. Such automated data collection and reporting systems are feasible and may be available with some development and may be less expensive and more reliable than manual methods of recordkeeping and reporting.

Trimble's web site advertises real-time (up to the minute) asset tracking and monitoring service plans ranging from $20 to $50 per month. Optional messaging capability is offered for $10 to $15 per month. A range of vehicle-mounted sensors is available to record real time data. Transcore Wireless' LinkTrak with Data Tracker system costs $1495 to purchase the hardware. Alternative lease costs are $44 per month for 4 years, with ownership of the equipment at 4 years. The LinkTrak system allows remote, real time monitoring of trailer location. The Data Tracker provides the capability to remotely monitor various parameters of interest. An add-on for reading and sending the odometer/hour meter reading would cost an additional $10 and should be available in the next six months. A recurring network charge of $45 - $50 per month also applies (TransCore, 2003).

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VII. THE PROPOSED AIRBORNE TOXIC CONTROL MEASURE AND ALTERNATIVES

In this chapter, we provide a plain English discussion of the key requirements of the proposed air toxic control measure (ATCM) for in-use diesel-fueled transport refrigeration units (TRU) and TRU generator sets, and facilities where TRUs operate. This chapter begins with a general summary of the ATCM. Each major requirement of the ATCM is discussed and explained. This chapter is intended to satisfy the requirements of Government Code section 11343.2, which requires that a noncontrolling "plain English" summary of the regulation be made available to the public. Unless otherwise noted herein, all references to TRUs include TRU generator sets. The term "facilities", as used herein, refers to facilities where TRUs operate, as defined in the regulation.

A. Summary of the Proposed ATCM

The proposed ATCM for In-Use Diesel-Fueled TRUs and TRU Generator Sets, and Facilities Where TRUs Operate is included in Appendix A. The regulation is designed to reduce the general public's exposure to diesel particulate matter (PM), other toxic contaminants, and air pollutants from TRUs. In addition, the ATCM would include record keeping and reporting requirements to provide staff up-to-date information on TRU operations at facilities where TRUs congregate.

The "in-use" requirements of the proposed ATCM would affect owners and operators of diesel-fueled TRUs that operate in California. This would include all carriers that transport perishable goods using refrigerated trucks, trailers, shipping containers, and railcars. There are a few local municipalities, school districts, and correctional institutions that operate TRUs that may be affected. Larger facilities where TRUs operate would also be affected. Military tactical support equipment would be exempt.

The proposed ATCM would require in-use TRU engines to meet performance standards, which vary by horsepower. The in-use performance standards have two levels of stringency that would be phased in over time. The first phase is called the "low emission TRU," or LETRU. The second phase is called "ultra-low-emission TRU" or ULETRU. Each of these standards can be met a number of ways. One way is to use an engine that is certified to the appropriate diesel PM emission level (e.g. repower with cleaner engine or replace the old TRU with a new or newer TRU with a cleaner engine). A second way is to equip the engine with the appropriate level of Verified Diesel Emissions Control Strategy (VDECS). A third way is to use an alternative technology that eliminates TRU diesel engine operation (and emissions) while at a facility. More detail will be provided below in the discussion of the requirements.

The engine certification values of the in-use performance standards are based on the Tier 4 nonroad standards proposed by U.S. EPA in their May 23, 2003 Notice of Proposed Rulemaking for Control of Emissions of Air Pollutants from Nonroad Diesel Engines and Fuel (hereinafter referred to as Nonroad Standards) (U.S. EPA 2003).

Staff is proposing to conduct a technology review in 2007 to evaluate technology readiness for the in-use requirements that would begin to be phased in by the end of 2008 and continue phase-in over the next 12 years. Part of the technology evaluation would be to determine if more stringent standards for these pollutants would be feasible for less than (<) 25 hp TRU engines in the 2010 to 2013 time-frame. In addition, ARB proposes a second technology review to be conducted in 2009 to evaluate whether technologies that would meet the ULETRU performance standard would be available and cost-effective for a broad spectrum of the model year 2003 through 2005 TRU and TRU generator set engines that would need to come into compliance by the end of 2010 through 2012, respectively.

TRU engines that use one of the "alternative technologies" listed in the ATCM would qualify as ULETRU for both horsepower categories, provided they meet certain operating conditions. In general, these operating conditions would eliminate diesel engine emissions at a facility, except during an emergency. These alternatives include the use of electric standby, cryogenic temperature control systems, alternative fuel, alternative diesel fuel, fuel cell power, or any other system approved by the Executive Officer to not emit diesel PM or increase public health risk while at a facility.

The proposal includes a provision that rewards operators for early compliance with the LETRU in-use performance standard by delaying the compliance date for meeting ULETRU in-use performance standard by an equal amount of time (e.g. one year of early compliance with LETRU is rewarded by a one year delay in compliance with ULETRU). The maximum delay in ULETRU compliance allowed would be three years.

Staff is proposing the use of an ARB identification (I.D.) numbering system for California-based TRUs. The intent is to expedite the inspection procedure and prevent false compliance claims. Such a system would be designed to prevent lengthy compliance inspections that would delay shipment of perishable goods. Similarly, non-California-based operators could voluntarily apply for ARB I.D. numbers for TRUs that are based outside of California but which operate in California.

The proposed ATCM includes provisions for operator reporting that would allow staff to monitor the implementation of the ATCM and provide more accurate estimates of pollutant reductions. Affected facilities (with ≥ 20 loading dock doors serving refrigerated storage areas) would be required to provide a one-time report that would help staff understand TRU operations at facilities better and to evaluate residual risk as the ATCM is implemented. Operator and facility data would be evaluated to determine if there is a need for a follow-on regulation to address residual risk to the public near certain types of facilities.

B. Discussion of the Proposed ATCM

Purpose

As specified in subsection (a) of the proposed ATCM, the regulation uses a phased approach to reduce the diesel PM emissions from in-use TRUs that operate in California. The resulting benefit would be reduced exposure to toxic air contaminants, including diesel PM, near facilities where TRUs operate. The main focus of this regulation is to reduce health risks near facilities where TRUs operate. However, depending on the compliance strategies chosen by TRU owner/operators, emissions that occur during on-road transport and related risk near roadways would also be reduced.

Applicability

As specified in subsection (b) of the proposed ATCM, the regulation would apply to owners and operators of diesel-fueled TRUs and TRU generator sets that are installed on trucks, trailers, railcars, and containers and which operate in the State of California. This would include operators that are based in California and provide both intrastate and interstate refrigerated carrier operations that use TRUs. This regulation would also apply to TRU operators based outside California, that deliver or pick up perishable goods to facilities in California and provide intrastate or interstate transport. In essence, all carriers that transport perishable goods in California using TRUs would be applicable under this regulation to the extent that they operate TRUs in California (e.g. the TRUs that they operate in California would have to comply with this regulation).

In addition, the regulation would apply to facilities located in California where perishable goods are loaded or unloaded for distribution through 20 or more loading dock doors serving refrigerated areas. Of these facilities, the ATCM facility requirements would only apply to those where the TRUs operating at the facility are owned, leased, or contracted for by the facility, its parent company, affiliate, or subsidiary and which operate under facility control. Facility control occurs when the facility determines the arrival, departure, loading and unloading, shipping and receiving of cargo. Facility control also occurs if the facility's parent company, affiliate, or subsidiary controls TRUs for the facility. Staff suspects that these facilities would be where the potential for elevated residual risk levels would be the greatest after the in-use performance standards were implemented. Also, the cost of record keeping and reporting should be more easily absorbed by these larger facilities and corporations.

Exemptions

Several clarifications on applicability are included here in the discussion of exemptions. First, engine-driven air conditioners don't meet the definition of TRU. Second, the regulation only applies to diesel-fueled TRUs and TRU generator sets. As defined, a TRU is a refrigeration system powered by an integral internal combustion engine, so, this regulation would not apply to refrigerated transport systems that use a fully

cryogenic cooling system (e.g. uses liquid carbon dioxide or liquid nitrogen). In addition, refrigerated transport that uses electrically driven refrigeration systems would not be applicable, but the generator set that typically provides the electric power (TRU generator set) would be applicable.

The facility requirements in this proposed regulation would not apply to facilities where no loading or unloading of perishable goods occurs, such as truck stops and intermodal facilities. Also, the facility reporting requirements in the proposed regulation do not apply to any facility that does not have control over any TRU and TRU generator set operations or does not own, lease, or operate TRUs at the facility. Examples of this would again include intermodal facilities and some cold storage warehouses that do not have control over TRUs, as defined, that would not be applicable. However, if a cold storage facility had any sort of facility control (as defined in the regulation) over TRUs, the facility requirements would apply. For example, if the arrival, departure, loading, unloading, shipping and/or receiving of cargo is determined by the facility, then the facility would be subject to the requirements of this regulation. As a hypothetical instance, a cold storage facility that allows businesses to operate on a day-to-day basis out of the facility or which schedules the arrival of refrigerated trailers and employs workers to load and unload perishable goods into these refrigerated trucks would need to comply with the facility record keeping and reporting requirements of the proposed ATCM.

The above discussion applies only to the facility requirements of the proposed regulation. A facility that is also a TRU operator would be required to meet other applicable requirements of the proposed regulation.

As specified in subsection (c) of the proposed ATCM, the regulation does not apply to military tactical support equipment.

Definitions

Most of the definitions listed in subsection (d) of the proposed ATCM were developed by staff, with input from the TRU Workgroup. Staff working on this ATCM also coordinated with staff working on other diesel PM ATCMs to provide consistency where it was practical. Please refer to Appendix A, subsection (d) for a list of definitions.

Requirements

As specified in subsection (e) of the proposed ATCM, the proposed regulation would require in-use TRUs to meet performance standards, which vary by engine horsepower. The in-use performance standards have two in-use emission categories that correspond to two levels of stringency that would be phased in over time. The first in-use emission category is called the "low emission TRU," (LETRU). The second, more stringent in-use emission category is called "ultra-low-emission TRU" (ULETRU). Each of these in-use emission categories represent performance standards that can be met a number of

ways, as discussed below. A TRU engine that meets ULETRU in-use performance standard automatically meets the less stringent LETRU in-use performance standard.

Table VII-1 shows the in-use performance standards that apply to <25 hp TRU and TRU generator set engines. Further explanation follows the table.

Table VII-1
<25 hp TRU and TRU Generator Set In-Use PM Performance Standards

In-Use Emission Category	Engine Certification (g/hp-hr)	Level of VDECS TRU or Engine Equipped with
Low Emission TRU (LETRU or L)	0.30	Level 2
Ultra-Low Emission TRU (ULETRU or U)	NA	Level 3

Less than 25 hp TRU and TRU generator set engines can meet the LETRU in-use performance standard with an engine, or engine and emissions control system, that is certified to 0.30 grams per horsepower-hour (g/hp-hr) or by installing a Level 2 verified diesel emission control strategy (VDECS), which would reduce diesel PM emissions at least 50 percent and up to 84 percent. The ULETRU in-use performance standard for <25 hp engines can be met by using a Level 3 VDECS, which would reduce PM emissions by 85 percent or greater. There would be no corresponding engine certification value for ULETRU in the <25 hp category because U.S EPA did not include a "long term" Tier 4 level in their Nonroad Standards. EPA has proposed the possible addition of a more stringent "long term" level, pending their technology review in 2007. If a more stringent level is adopted by U.S. EPA for <25 hp nonroad engines in the final rulemaking, or as the result of the technology review, then ARB may amend the TRU ATCM to include this as an engine certification value for the ULETRU in-use emission category.

Table VII-2 shows the in-use performance standards that apply to greater than or equal to (≥) 25 hp TRU and TRU generator set engines. Further explanation follows the table.

Table VII-2
≥ 25 hp TRU and TRU Generator Set In-Use PM Performance Standards

In-Use Emission Category	Engine Certification (g/hp-hr)	Level of VDECS TRU or Engine Equipped with
Low Emission TRU (LETRU or L)	0.22	Level 2
Ultra-Low Emission TRU (ULETRU or U)	0.02	Level 3

Greater than or equal to (≥) 25 hp TRU and TRU generator set engines can meet the LETRU in-use performance standard with an engine or engine and emission control system that is certified to 0.22 g/hp-hr or by installing a Level 2 VDECS on an in-use engine. Level 2 would reduce diesel PM by 50 percent to 84 percent. The ULETRU standard for ≥ 25 hp engines can be met with an engine or engine and emission control system that is certified to 0.02 g/hp-hr or by using a Level 3 VDECS on an in-use

engine, which would reduce diesel PM emissions 85 percent or greater. A TRU engine that meet the ULETRU in-use performance standard would also meets the less stringent LETRU in-use performance standard.

The engine certification values of the in-use performance standards are based on the U.S. EPA Tier 4 Nonroad Standards. Once U.S. EPA promulgates these regulations, ARB will adopt, in separate rulemaking, equivalent diesel engine standards that would also apply to new diesel engines. By design, this proposed ATCM's in-use engine compliance dates are one year later than the U.S. EPA's proposed Tier 4 Nonroad Standard compliance dates for new engines. This was done so that as new engines become available that comply with the Tier 4 standards, TRU operators could elect to repower with these new engines to comply with in-use requirements.

Another way to comply would be to demonstrate that an in-use engine met the appropriate in-use performance standard engine certification level. In this example, the engine certification Executive Order numbers that were granted to the TRU engine manufactures when the engine was new would need to be provided to staff. Staff plan to work with TRU and TRU engine manufacturers to develop a cross reference listing of engine models, engine certification Executive Orders, engine emission factors, and deterioration rates. This listing would include an indication of the in-use performance standard met (e.g. LETRU or ULETRU). Staff would make this list available to TRU operators on ARB's TRU web site.

U.S. EPA's May 23, 2003 proposal allows the use of a new steady-state test cycle for TRU engines (ref 40 CFR Part 89, Subpart G, section 1039.645). The proposed test cycle is intended to be more representative of the way TRU engines actually operate than the currently used 8-mode test cycle, which includes modes of operation that TRUs never use (e.g. idle at no-load, 10 percent and 100 percent of rated torque at rate speed, and 100 percent of rated torque at intermediate speed). The proposed test cycle has four modes: 75 percent and 50 percent torque at maximum test speed, and 75 percent and 50 percent torque at intermediate test speed. The weighting factors for each of these four modes would be split equally at 25 percent. TRU engine manufacturers have told staff that some Tier 1 and many Tier 2 TRU engines may be able to meet the LETRU in-use performance standards, if the engine certification data is evaluated with the steady-state TRU test cycle. Initial staff evaluation of modal engine certification data indicates that emission factors will be less for the proposed test cycle compared to the current test cycle. The amount of PM emission factor reduction ranges from 25 percent to 60 percent, depending on engine model. But, staff found that nitrogen oxide (NOx) emission factors may increase for some engines when using the proposed steady state TRU test cycle.

Staff supports the proposed TRU test cycle, provided manufacturers use the test cycle for all pollutants. Staff also supports this provision of EPA's proposal, as applied to new engine certifications since it allows an optimized reduction of actual emissions and prevents the costly over-design of the emission control system to cover modes of operation that are not used in practice.

However, the retroactive use of the steady-state TRU test cycle to re-evaluate Tier 1 and Tier 2 engine emissions to meet the in-use performance standard engine certification levels would not be allowed, according to U.S. EPA. This policy position is supported by ARB as well.

The other in-use compliance approach mentioned above would be to install the appropriate level of VDECS. As discussed in Chapter VI, diesel emission control strategies must be verified by ARB's Mobile Source Control Division under the *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines (13 CCR Sections 2700 – 2710)* before they can qualify as a VDECS. Staff believes that use of the required level of VDECS for each in-use emission category will result in engine PM emission rates that are roughly equivalent to that required by the engine certification levels assigned to each category. For example, a 34 hp Tier 2 engine meeting a 0.45 g/hp-hr certification standard that used a Level 2 VDECS (50 percent to 84 percent PM reduction) to comply with the proposed LETRU in-use performance standard would then have PM emissions that would be at least equivalent to the proposed LETRU in-use performance standards under the engine certification level of 0.22 g/hp-hr.

As noted above, EPA has proposed a technology review in 2007 that would evaluate the progress made toward applying advanced PM and NOx control technologies to the <25 hp engine category. Part of that evaluation would be to determine if more stringent standards for these pollutants was feasible for the 2010 to 2013 time-frame. ARB would conduct a similar technology review in 2007 to evaluate whether verified control technologies are available and cost-effective for a broad range of models in time for the end of 2008 compliance date. In addition, ARB would conduct a second technology review in 2009 to evaluate whether technologies that would meet the ULETRU in-use performance standard would be available and cost-effective for a broad spectrum of TRU engines that would need to come into compliance starting at the end of 2010. A discussion of cost-effectiveness is included in Chapter VIII.

TRU owner/operators that voluntarily use one of the "alternative technologies" listed in the ATCM would qualify the TRU engine as ULETRU for both horsepower categories, provided they meet certain conditions. In general, these conditions would eliminate diesel engine emissions at a facility, except during an emergency. Some of these alternatives would still involve the use of a TRU engine (e.g. electric standby) during on-road transport away from the facility. In such cases, it is staff's intent to allow a reasonable amount of TRU engine operation during ingress and egress yard maneuvering operations ("reasonable" means a few minutes). These alternative technologies include the use of electric standby, cryogenic temperature control systems, alternative fuel, alternative diesel fuel, fuel cell power, or any other system approved by the Executive Officer to not emit diesel PM or increase public health risk while at a facility. Alternative technologies only qualify toward compliance with the ULETRU in-use performance standard requirement if they eliminate diesel engine operations at facilities. The use of an alternative technology would obviously satisfy the less stringent LETRU in-use performance standards, provided diesel engine operations were

eliminated at the facility. Conditions are included in each of the listings for eligible alternative technologies to reinforce the obligation to eliminate diesel engine operations at the facility.

If operators are unable to eliminate the operation of the TRU diesel engine while at all facilities, then the alternative technology would not be in compliance. This leads to the conclusion that alternative technologies may only work for facilities that are also operators of captured fleets of TRUs. Captured fleets involve operators whose TRUs only go to the operator's facilities. In this case, the operators' facilities would all be equipped with the infrastructure necessary to ensure the TRU engine operations are eliminated while the TRU is at that facility. Although captured fleets may be natural candidates for alternative technologies, other operators may also be able to use alternative technologies as long as they can meet the conditions that eliminate the engine operation while at a facility.

Compliance Dates

Compliance dates for meeting the in-use performance standards are phased in over time. Compliance dates for <25 hp TRU and TRU generator set engines are shown in Table VII-3, with further explanation following the table.

Table VII-3
<25 hp TRU and TRU Generator Set Engines
In-Use Compliance Dates

MY	In-Use Compliance Year													
	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20
2001 & Older									U	U	U	U	U	U
2002										U	U	U	U	U
2003				U	U	U	U	U	U	U	U	U	U	U
2004					U	U	U	U	U	U	U	U	U	U
2005						U	U	U	U	U	U	U	U	U
2006							U	U	U	U	U	U	U	U
2007								U	U	U	U	U	U	U
2008									U	U	U	U	U	U
2009										U	U	U	U	U
2010											U	U	U	U
2011												U	U	U
2012													U	U
2013														U

The TRU engine model years are shown in the left column. In-use compliance years are shown across the top. The compliance date is December 31st of the compliance year shown. Black shaded areas are years with no requirements since in-use compliance year precedes model year. Dark shaded areas without letter codes have no requirements, pending in-use compliance date. "L" means must meet LETRU in-use performance standards. "U" means must meet ULETRU in-use performance standards.

The first row under the column heading in the table shows that 2001 and older model year TRU engines would come into compliance with the LETRU in-use performance standards by the end of 2008. This is true for both horsepower categories (see below). The second row below the column headings shows the 2002 TRU engines would come into compliance with LETRU in-use performance standards by the end of 2009. From the third row on (2003 and subsequent model years), the ULETRU in-use performance standard would have to be met by the end of the seventh year past the model year.

Compliance dates for ≥ 25 hp TRU and TRU generator set engines are shown in Table VII-4, which uses the same layout and nomenclature as just described for the <25 hp TRU engines.

Table VII-4
≥ 25 hp TRU and TRU Generator Set Engines
In-Use Compliance Dates

MY	In-Use Compliance Year													
	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20
'01 & Older									U	U	U	U	U	U
'02										U	U	U	U	U
'03				U	U	U	U	U	U	U	U	U	U	U
'04					U	U	U	U	U	U	U	U	U	U
'05						U	U	U	U	U	U	U	U	U
'06							U	U	U	U	U	U	U	U
'07								U	U	U	U	U	U	U
'08									U	U	U	U	U	U
'09										U	U	U	U	U
'10'											U	U	U	U
'11												U	U	U
'12													U	U
'13														

For ≥ 25 hp TRU engines, the proposed nonroad diesel new engine standards for a model year 2013 engine would be the same as the ULETRU in-use performance standard (0.02 g/hp-hr). Therefore, 2013 and subsequent model year TRU engines in the ≥ 25 hp category would automatically comply with the ULETRU in-use performance standards and the VDECS compliance approach would "sunset." For <25 hp TRU engines, however, this would not be true because, as proposed, there would be no in-use performance standard for the ULETRU engine certification level. Into the foreseeable future, operators of <25 hp TRU engines would have to use a Level 2 or Level 3 VDECS after the end of 7 years beyond the model year of the engine to comply with the proposed ULETRU in-use performance standards. If a more stringent "long term" Tier 4 PM standard is adopted for <25 hp nonroad diesel engines, ARB would amend this ATCM to include that standard as the in-use ULETRU engine certification value. Then, a similar "sunset" to the VDECS requirement would take effect, similar to that described for the ≥ 25 hp category.

Staff plans to conduct notification and outreach to operators and facilities to explain and clarify these in-use requirements.

Early Compliance Incentive

The proposed ATCM includes a provision to encourage operators of 2002 and older model year TRU engines to comply early with LETRU in-use performance standards. A year delay in meeting the ULETRU in-use compliance date would be provided for each year of early compliance with the LETRU in-use performance standards (e.g. one year of early compliance with LETRU results in a one year delay in compliance with ULETRU standards). The maximum delay allowed would be three years. For example, a model year 2001 TRU engine would normally be required to comply with LETRU performance standards by the end of 2008 and ULETRU in-use performance standards by the end of 2015. But if the operator brought this TRU engine into compliance with the LETRU in-use performance standards at the end of 2005 (3 years early), then the ULETRU in-use performance standard compliance date would be delayed three years, until the end of 2018. In this example, there would be 13 years between the LETRU and ULETRU compliance dates and the TRU would be 17 years old when ULETRU compliance occurred. This may be a likely time to retire the TRU (or sell it out-of-state), rather than retrofit the engine to comply with the ULETRU in-use performance standard. Staff believes that this incentive would reduce the burden of compliance on operators by spreading out the costs over several years ahead of time and still accelerate attrition near the end of the equipment life.

The ULETRU in-use performance standard compliance delay granted would be rounded to the nearest full year. If LETRU compliance was demonstrated to have occurred 183 days or more earlier than required, then a one year delay would be granted. If LETRU compliance is demonstrated to have occurred 182 days or less early, then no delay would be granted.

This compliance delay would not be available to the TRU operator if the TRU engine manufacturer is using the early compliance with engine emission standards in any averaging, banking, and trading program (either U.S. EPA's or the California equivalent program). Allowing both a delay and an emission reduction credit would cause an emissions accounting discrepancy such that emissions benefits would be lost or exaggerated.

In addition, early compliance with the LETRU in-use performance standard is possible only if real emission reductions occur as a result of early compliance. For example, installing a Level 2 VDECS one year before the LETRU requirement deadline would count toward a one year ULETRU compliance delay. Replacing an old engine with a new engine that was certified to meet the LETRU in-use performance standard under engine certification would also count, provided the new engine PM emissions factor was less then the existing engine PM emission factor. However, simply showing that an in-use engine met the LETRU in-use engine certification level when it was certified as a new engine, without otherwise reducing diesel PM emissions, would not count toward a

ULETRU delay. However, as noted previously, this approach could be used to show LETRU compliance for the normal compliance deadline. To reinforce the point, the ULETRU compliance delay will only be granted if real emission reductions occur.

ARB Identification Numbers

Staff is proposing the use of an ARB identification (I.D.) numbering system for TRUs and TRU generator sets to help expedite the inspection procedure (which is intended to prevent shipping delays of perishable goods), and to prevent false compliance claims. Owner/operators of all California-based TRUs and TRU generator sets would be required to apply for an ARB I.D. number for each new and in-use TRU engine under their control. If the TRU engine was an early compliance unit or had achieved compliance at any level, the operator would be required to provide details that ARB could use to confirm compliance at time of inspection. ARB would then issue a coded I.D. number that operators would be required to paint on each TRU chassis housing in clear view. The I.D. numbers would indicate the level of compliance achieved. Inspectors in the field would use the I.D. number verify compliance and carrier information. Similarly, non-California-based operators could voluntarily apply for ARB I.D. numbers for TRUs that are based outside of California but which operate from time to time in California. The intent of offering such an approach to non-California-based operators would be to avoid shipping delays of perishable goods coming into and going out of California.

Fuel Requirements

The regulation includes fuel requirements that would apply to TRU operators that voluntarily opt to use alternative diesel fuel to meet the in-use requirements. Record keeping would be required to assure continued exclusive use of the chosen alternative diesel fuel for operations in California. Furthermore, to qualify for compliance with in-use requirements, only alternative diesel fuels that have been verified under the Verification Procedure would be allowed to be used.

In addition, if an operator chose a VDECS that required certain fuel properties to be met in order to achieve the required PM reduction, then the operator would be required to only fuel the subject TRU with fuel that meets these specifications when operating in the state of California. Operators would be responsible for making appropriate arrangements with any contractor that provides fueling services to TRUs under their control to assure exclusive use of the chosen alternative diesel fuel.

Furthermore, if an operator chose a VDECS that required certain fuel properties to be met in order to prevent damage to the VDECS or an increase in toxic air contaminants, other harmful compounds, or in the nature of the emitted PM, the operator would be required to fuel the subject TRU only with fuel that meets those specifications.

The proposed regulation does not include a requirement to use CARB diesel in TRUs. However, it should be noted that TRUs can only be fueled in California with vehicular

CARB diesel, starting September 1, 2006, in accordance with California Code of Regulations, Title 13, Section 2281(a)(4).

Record Keeping and Reporting

As specified in subsection (f) of the proposed ATCM, the proposal includes provisions for TRU operator reporting that would allow staff to obtain more accurate information on of the number of TRUs and TRU operators in California, to monitor the implementation of the ATCM, to estimate pollutant reductions based on compliance choices the operators make, and to facilitate inspections by ARB's Enforcement Division. Starting in 2009, affected TRU operators would be required to report TRU inventory information about the TRUs they operate (e.g. make, model, serial number), the terminals where they domicile TRUs, and how and when they come into compliance with the in-use requirements of the ATCM. Additional reports would be required within 30 days of any changes to this information.

Large facilities where TRUs operate would also be required to submit a one-time report to ARB by the end of January, 2005 which would provide more accurate information about how TRUs operate at facilities. Staff would use the information to evaluate the effectiveness of the regulation and address any remaining risk at facilities after the implementation of the proposed ATCM. Operator and facility data would be evaluated to determine if there is a need for a follow-on regulation to address residual near-source risk at facilities. Some of the information requested would be used to determine if it would be possible to narrow the scope of applicability of such a follow-on regulation (e.g. the North American Industrial Classification System codes applicable to the facility, the number of loading dock doors serving refrigerated areas, the square feet of refrigerated storage space). Record keeping that supports the information reported would also be required to be compiled and made available to ARB inspectors upon request for three years.

The TRU ATCM currently requires submittal to ARB by mail, however, staff plan to develop the potential for electronic report submittals in time for both operator and facility reporting deadlines. In addition, staff plans to conduct outreach to operators and facilities to explain and clarify these reporting requirements.

Prohibitions

As specified in subsection (g) of the proposed ATCM, people engaged in the State in the business of selling, renting or leasing new or used TRUs would be prohibited from importing, delivering, purchasing, receiving, or acquiring new or used TRU engines that do not comply with the ATCM. And, people engaged in California in the business of selling new and used TRU engines would be prohibited from selling to any resident of the State or a person that could reasonably be expected to do business in the state a new or used TRU engine that does not comply with the ATCM. In addition, people engaged in the State in the business of renting or leasing new or used TRU engines would be prohibited from renting, leasing, or offering for rent or lease, any new or used

TRU engine in the State that did not comply with the ATCM. Finally, the operators of facilities and operators of affected TRUs would be prohibited from taking action to divert TRUs to alternative staging areas in order to circumvent the requirements of the regulation.

C. Alternatives Considered

The Government Code section 11346.2 requires the ARB to consider and evaluate reasonable alternatives to the proposed regulation and provide the reasons for rejecting those alternatives. Staff identified two alternatives to the proposed control measure: "no action" and require electric-powered refrigeration systems while transport units are at a facility. Each of the two alternatives were evaluated addressing applicability, effectiveness, enforceability, and cost/resource requirements.

This section discusses each of the two alternatives and provides reasons for rejecting those alternatives.

Alternative One – No Action

The "no action" alternative would rely on progressively more stringent State and federal emission standards for new nonroad engines to come into effect over time.

Prior to 1995 there were no emissions standards for <25 hp nonroad diesel engines. Small Off-road Engine (SORE) standards applied to <25 hp diesel engines for 1995 through 1999 model years. Tier 1 nonroad standards affected model year 2000 through 2004. Tier 2 standards for <25 hp diesel engines will take effect in 2005, followed by Tier 4 standards in 2008.

Similarly, prior to 1999, there were no emission standards for ≥ 25 hp to <50 hp nonroad diesel engines. Tier 1 nonroad standards affected model year 1999 through 2003. Tier 2 standards for ≥ 25 hp to 50 hp diesel engines will take effect in 2005. U.S. EPA's proposed Tier 4 standards would apply to ≥ 25 hp to <75 hp diesel engines (note modified horsepower range) with two compliance pathways. Engine manufacturers can opt to meet "interim" Tier 4 standards in 2008 and "long term" Tier 4 emission standards in 2013. Alternatively, they may skip the "interim" standards in 2008 and meet the "long-term" emission standards in 2012, one year earlier.

1. Applicability

This alternative could be applied to the purchase of new TRU engines.

2. Effectiveness

According the TRU manufacturers, the life of a TRU engine is between 12,000 hours and 20,000 hours, depending on the whether the TRU is a truck or trailer model and the quality of preventive maintenance. Some TRU operators, on the other hand, claim they

can get 25,000 to 30,000 hours out of trailer TRU engines. Annual engine hour accrual varies significantly, resulting in a wide range in the life of a TRU engine in terms of years. High-use TRUs can accrue these hours in 7 to 10 years. Low-use TRUs could result in older engines with higher emission rates that could be in the field for many years. Staff has discovered TRU engines in the field that are over 30 years old. Staff believes that TRU engine attrition rates must be accelerated to remove older TRU engines from the inventory and reduce public health risk in a reasonable amount of time. The "no action" alternative would not accelerate engine attrition rates and reduce the potential health risk posed by TRU diesel engines. Therefore, the "no action" alternative was rejected by staff.

3. Enforceability

The U.S. EPA and ARB currently share enforcement responsibilities for assuring new nonroad diesel engines meet the nonroad engine emission standards.

4. Cost and Resource Requirements

This alternative would not cause any increase in the current cost and resource requirements.

Alternative Two – Require Electric-Powered Refrigeration Systems while Transport Refrigeration Units are at a Facility

This alternative was described in Chapter VI – Availability and Technical Feasibility of Control Measures under the heading "Electric Standby". In order to reduce diesel PM emissions and related risk to an acceptable level, staff believes that TRUs would need to be plugged into "grid" power at all times while at a facility, except when not in operation, when being moved around the facility yard, or during an emergency. To accomplish this, all TRUs would have to be equipped with electric standby (E/S) and power outlets would be necessary at parking areas and loading dock doors. The cost of the electric power infrastructure that would be necessary is significant. Most of the TRU models designed for straight trucks (<25 hp) have the E/S option available and about 40 percent to 80 percent of the straight trucks in the field today are equipped with E/S. Only about half of the TRU models designed for trailers (>25 hp) have the E/S option available and about 0.5 percent to three percent of the trailers in the field today are equipped with E/S. The acceptable level of risk, according to many local air districts is 10 excess cancer cases per million over 70 years.

Staff proposed this alternative as a prescriptive requirement in the early phases of control measure development. Regulatory concepts were developed and presented to stakeholders at several TRU Workgroup meetings, where cost and feasibility issues were raised. A series of special TRU electrification workgroup meetings were also conducted to explore solutions to these issues. Staff learned that this approach had some significant issues, as discussed below. A more detailed discussion of these issues and others is included in Chapter VI.

Although staff elected to abandon the "electric standby" option, it was retained in the proposed ATCM as one of the "alternative technologies" that may be used to achieve compliance. Operators that choose this option may be successful in resolving some of the attendant issues, paving the way for more common use.

1. Applicability

This alternative has limited applicability because not all TRU models offer the electric standby option. But, if electric standby became available on all models (through extensive redesigns of some models), it could be applied at facilities affected by the proposed regulation. This alternative may not be practical at intermodal facilities and rail switchyards. Many complex issues related to who would be the responsible party in the event of violations (e.g. unit found operating on conventional diesel power because compatible infrastructure unavailable) and who pays for the electric power would need to be resolved in advance.

2. Effectiveness

This alternative would virtually eliminate TRU engine operating time at the facilities currently affected by the proposed regulation, and therefore, would eliminate diesel PM emissions. However, this would occur at a very high cost since the majority of existing TRU models would have to be scrapped or sold out of state because retrofits are prohibitively expensive or impossible due to design constraints (see Cost and Resource Requirements below).

3. Enforceability

A compliance verification system would need to be devised (e.g. active equipment identification transponders, fenceline global positioning systems (GPS), and data loggers) and ARB staff would need to conduct surveillance, make unannounced inspections, and conduct audits to assure compliance with the requirement that TRUs be plugged into grid power when in use at a facility. It would be difficult to ensure that all TRUs coming into a facility that were not under facility control were in compliance. For example, most inbound loads are typically operated by carriers that fall outside the control of the facility.

4. Cost and Resource Requirements

As currently designed, the electric motors used for E/S are only sized to hold a set point temperature and do not have sufficient power to be used to pre-cool the transport van enclosure in a reasonable amount of time prior to loading. Increasing the power rating of the electric motors used in E/S would require significant redesign due to space and structural limitations. The cost for the E/S option may be higher in the first few years to recover development costs.

There are also electric power infrastructure compatibility issues. Most E/S units are designed to use three-phase power, which is available at most new facilities, but older facilities (typically small facilities) may have only single-phase power available. Also, there are a number of three-phase voltages used at facilities (e.g. 240, 408, 430, 440, and 480 volt). Also, plug compatibility could be an issue since there are dozens of plug configurations available for three-phase connections. There are safety concerns with plugging into a high voltage power source, especially during inclement weather, and with "drive-off" damage (drivers failing to disconnect the power before driving away).

The cost of the E/S option adds $2,000 to $2,600 to the cost of a trailer TRU and $350 to $600 to a truck TRU. Adding the power infrastructure at the facilities where TRUs operate is also expensive. Loading door outlets cost about $1,250 each if no transformer upgrades are necessary. With transformer upgrades, the cost goes up to $5,000 per outlet for 480 volt and $7,000 per outlet for 208 volt (Warf, 2002). For power outlets in the truck and trailer parking areas, electrical codes require power distribution to be underground, so infrastructure costs go up significantly due to trenching.

Currently, only 0.5 percent to three percent of trailer TRUs and 40 percent to 80 percent of truck TRUs are equipped with E/S, according to ThermoKing and Carrier. No attempts to retrofit an E/S to units that are not factory-equipped are known to have been completed. Previous interest in retrofitting has been blunted by cost estimates that were prohibitively high – in the $6,000 to $8,000 range (Guzman, 2002).

For-hire carriers using trailers are reluctant to pay the extra cost to buy the E/S option because there are very few facilities equipped to provide electric power. Furthermore, facilities are reluctant to add power plug-ins because few carriers have the E/S option and they don't want to pay for the electric power for carriers bringing goods in.

Enforcement would be conducted by ARB Enforcement Division. Cost estimates for enforcement of the proposed ATCM are included in Chapter VIII. Staff believes that enforcement costs for this alternative would be similar to those for the proposed ATCM.

D. Evaluation of the Proposed ATCM

Staff evaluated the proposed control measure against the same criteria that the alternatives were evaluated against: applicability, effectiveness, enforceability, and cost/resource requirements.

Applicability

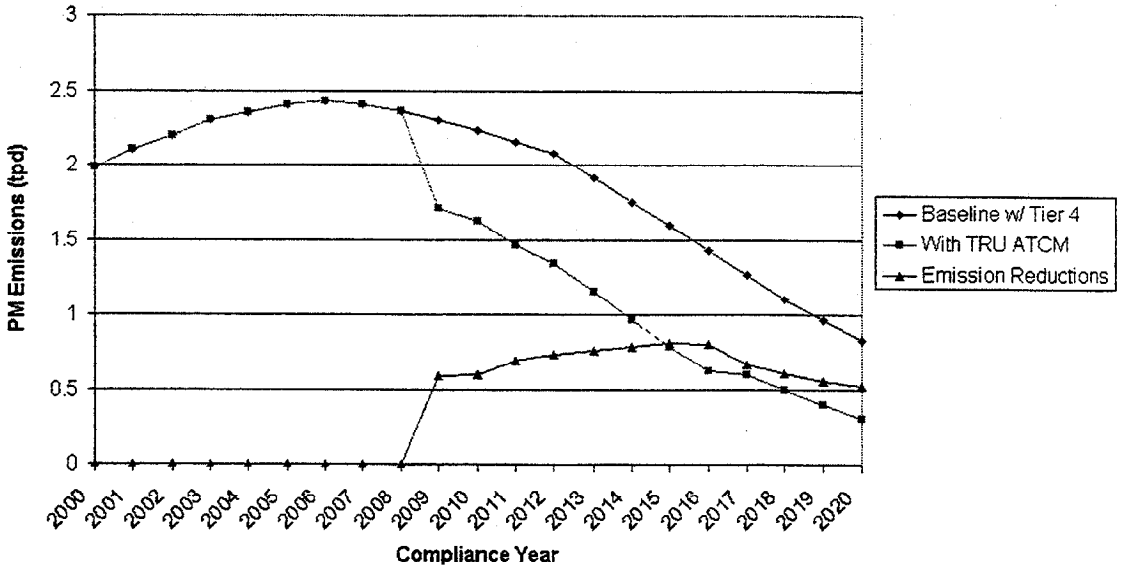
The proposed control measure could be applied to in-use operators of TRUs to reduce diesel PM from in-use TRUs and TRU generator sets operated in California. TRU operators would also be required to keep records and submit reports. Large facilities would be required to keep records and provide a one-time report.

Effectiveness

The proposed control measure would reduce diesel PM emissions from in-use TRUs faster than normal attrition rates would with progressively more stringent new nonroad engine emission standards. Figure VII-1 shows a comparison of the annual TRU PM emissions resulting from new engine standards being implemented and the annual emissions as the proposed ATCM is concurrently implemented. Emission reductions are also shown in this figure. The ATCM would require 2002 and older model year TRU engines to reduce emissions by 50 percent when they comply with the LETRU in-use performance standards. Also, an 85 percent reduction in PM emissions would apply to all TRUs, meeting the ULETRU in-use performance standards, until new TRU engines meet ULETRU.

Figure VII-1

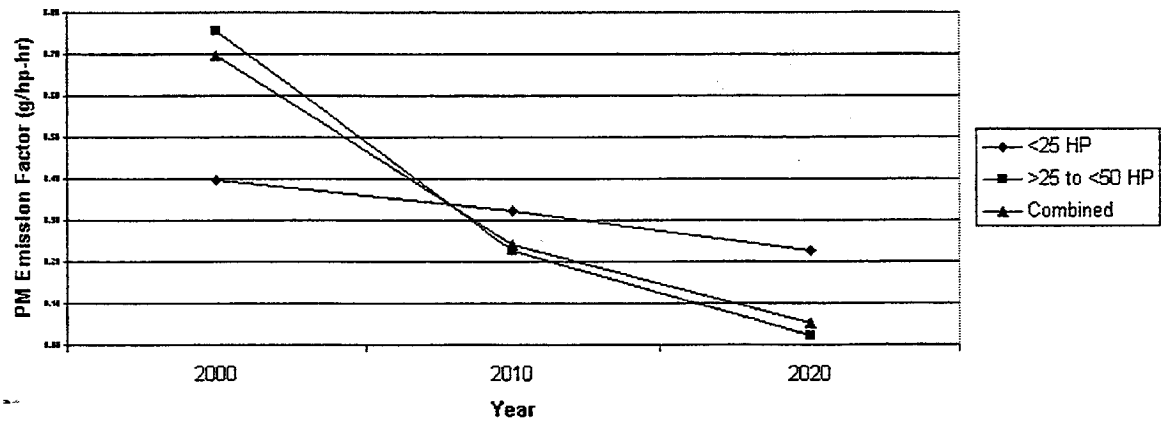
TRU PM Emissions for All Types and Horsepower Categories Includes Proposed Tier 4 NonRoad Standards and Estimated Adjustment for Manufacturer-Provided Emission Factors



Staff estimated Statewide fleet PM emission factors for all TRUs operating in California for 2000, 2010, and 2020, taking into account the Tier 4 nonroad new engine emission standards and the implementation of the TRU ATCM. Historical engine emission factors that were provided by TRU engine manufacturers were incorporated into this estimate for model years where data was available for all engine manufacturers. Figure VII-2 displays the results. The graph shows that there would be a 65 percent reduction in the Statewide PM emission factor for TRU engines between 2000 and 2010 and a 92 percent reduction between 2000 and 2020.

Figure VII-2

Statewide TRU Engine PM Emission Factor Trend
With Effects of Tier 4 Nonroad/Offroad New Engine Standards
and TRU ATCM In-Use Performance Standards



The recordkeeping and reporting provisions would provide the information necessary to monitor the effectiveness of the ATCM in reducing risk and address any remaining risk after the implementation.

Enforceability

The proposed control measure would be enforced by ARB's Enforcement Division in conjunction with the Heavy Duty Vehicle Inspection Program through inspections at border crossings, CHP scales and other locations that do not hinder traffic flow. In addition, ARB inspectors would conduct audits at TRU operator terminals. The proposed control measure offers a number of compliance options, so ARB inspectors would have to acquire a basic understanding of each option. But, the proposed control measure is more enforceable than Alternative Two (Require Electric-Powered Refrigeration Systems While Transport Refrigeration Units are at a Facility). While the use of electric standby is still offered as a compliance option, fewer operators would use that pathway than would have been the case under Alternative Two, so staff believes the enforcement challenges would be less overall.

Cost and Resource Requirements

The proposed control measure would have a fiscal impact on the State, as well as an economic impact on the operators and facilities where TRUs operate. Enforcement would be conducted by ARB Enforcement Division. Cost estimates for enforcement and compliance for this ATCM are included in Chapter VIII.

E. Statewide Emissions and Risk Reduction Benefits of the Proposed ATCM

A discussion of the Statewide baseline TRU PM emissions is included in a section in Chapter V – Emissions, Exposure, and Risk from Diesel TRUs. Statewide TRU emissions are also discussed for various scenarios in Chapter VIII – Economic Impacts. And, staff modeled the emission reductions that may be realized by implementing the proposed ATCM. Emission reductions due to the proposed ATCM is included Chapter IX – Environmental Impacts.

REFERENCES

Guzman, 2002. Peter Guzman, Carrier Transicold, Special TRU Electrification Workgroup Conference Call Meeting, May 28, 2002.

U.S. EPA, 2003. U.S. Environmental Protection Agency, *Control of Emissions of Air Pollutants from Nonroad Diesel Engines and Fuel, Proposed Rule Making* Notice of Proposed Rule Making, Federal Register. Vol. 68 No. 100, pp. 28327-28603, May 23, 2003.

Warf, 2002. Bill Warf, Sacramento Municipal Utility District, to Steve Cruz, Public Policy Alliance. *Personal communication (electronic mail),* April 3, 2002.

VIII. ECONOMIC IMPACTS

This chapter presents the estimated costs and economic impacts associated with implementation of the proposed airborne toxic control measure (ATCM) to regulate diesel-fueled engines associated with in-use transport refrigeration units (TRUs) and TRU generator sets. The discussion includes estimates of capital and recurring costs for potential compliance options and an analysis of the proposed ATCM's cost effectiveness. The compliance options addressed include engine retrofit, engine replacement, TRU replacement, and alternative technologies.

Unless otherwise noted, all references to TRUs in this chapter include TRU generator sets. Also, in this chapter, the term "facilities" refers to facilities where TRUs operate as defined in the proposed ATCM.

A. Summary

Staff estimates that the total cost of the proposed ATCM to affected businesses would range from $87 million to $156 million over the 13-year effective life of the ATCM (i.e., 2008-2020). No significant economic impacts to school districts, local public agencies, State agencies, or federal agencies are expected because few of these agencies operate TRUs or facilities that are subject to the ATCM. ARB administrative costs for initial outreach and educational efforts, as well as enforcement duties, would be absorbed within existing budgets and resources.

Affected businesses may use several means to comply with the proposed ATCM, including engine retrofit, engine replacement, TRU replacement, and alternative technologies such as electric standby and the use of cryogenic temperature control. Table VIII-1 summarizes the capital and annual per-unit costs of making an in-use TRU compliant with the proposed ATCM. These estimates do not include any reporting or recordkeeping costs incurred by TRU operators as a result of the ATCM. The capital cost is the full up-front cost of the compliance technology, including hardware and installation costs. The annual cost includes operating and maintenance expenses that are over and above those normally incurred when operating a diesel fuel-powered TRU, as well as capital payments for compliant equipment. The capital payments are based on the assumption that the capital cost is financed via a loan that is repaid over 10-years at a 5 percent annual real interest rate.

Table VIII-1

Estimated Cost-Per-TRU for Affected Businesses[1]

Technology	Capital Cost[2] (dollars/unit)	Annual Cost[3] (2008-2020)
Engine Retrofit (VDECS)	$2,050 (high-end cost)[4]	$560 (high-end cost)[4]
Engine Replacement [5] <25 hp (truck) ≥25 to 50 hp (trailer)	 $4,000 $5,000	 $500[6] $650[6]
TRU Replacement[5] <25 hp (truck) ≥25 to 50 hp (trailer)	 $10,000 $20,000	 $1,300[6] $2,600[6]
Electric Standby	$15,600	$2,500
Cryogenic	$22,000	$9,000

1. Estimates include California-based and out-of-state businesses operating TRUs in California.
2. The capital cost estimate assumes a lump-sum, one-time cost.
3. Assuming a 10-year useful life and a real interest rate of five percent, the annual cost estimate includes yearly loan payments for equipment and operating and maintenance costs. It does not include reporting costs.
4. The high-end cost estimate for VDECS retrofit is discussed in Section C.2.2 of this chapter.
5. This estimate represents full replacement cost. (Note: Elsewhere in this chapter, replacement cost has been prorated.)
6. For the purpose of evaluating cost to individual businesses, only a portion of the annual cost (40 percent of replacement cost for TRU engines 10-years-old and newer and 15 percent of replacement cost for TRUs 11-years-old and older) is attributable to this ATCM for TRU engine and TRU replacement. This annual cost estimate is based on the assumption that there is no difference in operating/maintenance costs for existing and replacement engines or TRUs. The estimated amount represents uniform payments to cover the capital cost.

For individual businesses, the compliance cost will vary depending on the compliance option selected and the number of TRUs owned/operated. Tables VIII-2 and VIII-3 show the estimated capital and annual cost for a small business with 1 to 20 TRUs (Table VIII-2) and for a typical business with 21 to 250 TRUs (Table VIII-3). In contrast to Table VIII-1, Tables VIII-2 and VIII-3 include recordkeeping/reporting costs in the capital cost estimates to reflect the proposed ATCM's requirement for a one-time report submittal with updates as necessary.

Table VIII-2

Estimated Cost for a Small Business TRU Operator[1]

Technology	Capital Cost[2]		Annual Cost[3] (2008-2020)	
	1 unit	20 units	1 unit	20 units
Engine Retrofit (VDECS)	$300 (high-end cost)[4]	$5,300 (high-end cost)[4]	$600 (high-end cost)[4]	$11,000 (high-end cost)[4]
Engine Replacement [5] <25 hp (truck) ≥25 to 50 hp (trailer)	$600 $700	$10,400 $13,000	$600[6] $700[6]	$10,400[6] $13,000[6]
TRU Replacement[5] <25 hp (truck) ≥25 to 50 hp (trailer)	$1,300 $2,600	$26,000 $52,000	$1,300[6] $2,600[6]	$26,000[6] $52,000[6]
Electric Standby	$2,000	$40,400	$2,500	$50,800
Cryogenic	$2,900	$57,000	$9,000	$180,000

1. Estimates include California-based and out-of-state businesses operating TRUs in California.
2. The capital cost estimate assumes that new equipment will be paid for in yearly loan payments amortized over 10 years. The capital cost also includes an estimate of operator reporting costs.
3. Assuming a 10-year useful life and a real interest rate of five percent, the annual cost estimate includes yearly loan payments for equipment and operating and maintenance costs. It does not include reporting costs.
4. The high-end cost estimate for VDECS retrofit is discussed in Section C.2.2. of this chapter
5. This estimate represents yearly loan payments for the full replacement cost of equipment.
6. For the purpose of evaluating cost to individual businesses, only a portion of the annual cost (40 percent of replacement cost for TRU engines 10-years-old and newer and 15 percent of replacement cost for TRUs 11-years-old and older) is attributable to this ATCM for TRU engine and TRU replacement. This annual cost estimate is based on the assumption that there is no difference in operating/maintenance costs for existing and replacement engines or TRUs. The estimated amount represents uniform payments to cover the capital cost.

Table VIII-3

Estimated Cost for a Typical Business TRU Operator[1]

Technology	Capital Cost[2]		Annual Cost[3] (2008-2020)	
	21 units	250 units	21 units	250 units
Engine Retrofit (VDECS)	$5,600 (high-end cost)[4]	$67,000 (high-end cost)[4]	$7,900 (high-end cost)[4]	$139,000 (high-end cost)[4]
Engine Replacement [5] <25 hp (truck) ≥25 to 50 hp (trailer)	$11,000 $14,000	$130,000 $162,000	$11,000[6] $14,000[6]	$130,000[6] $162,000[6]
TRU Replacement[5] <25 hp (truck) ≥25 to 50 hp (trailer)	$27,000 $54,000	$324,000 $648,000	$27,000[6] $54,000[6]	$324,000[6] $648,000[6]
Electric Standby	$42,000	$505,000	$53,000	$635,000
Cryogenic	$60,000	$713,000	$189,000	$2,300,000

1. Estimates include California-based and out-of-state businesses operating TRUs in California.
2. The capital cost estimate assumes that new equipment will be paid for in yearly loan payments amortized over 10 years. The capital cost also includes an estimate of operator reporting costs.
3. Assuming a 10-year useful life and a real interest rate of five percent, the annual cost estimate includes yearly loan payments for equipment and operating and maintenance costs. It does not include reporting costs.
4. The high-end cost estimate for the VDECS retrofit is discussed in Section C.2.2 of this chapter.
5. This estimate represents yearly loan payments for the full replacement cost of equipment.
6. For the purpose of evaluating cost to individual businesses, only a portion of the annual cost (40 percent of replacement cost for TRU engines 10-years-old and newer and 15 percent of replacement cost for TRUs 11-years-old and older) is attributable to this ATCM for TRU engine and TRU replacement. This annual cost estimate is based on the assumption that there is no difference in operating/maintenance costs for existing and replacement engines or TRUs. The estimated amount represents uniform payments to cover the capital cost.

Staff also estimated the proposed ATCM's cost effectiveness as cost per pound of diesel particulate matter (PM) reduced. Diesel PM reduction from the proposed ATCM has been estimated to range from 383,000 to 592,000 pounds per year over the 2008-2020 effective life of the regulation. Considering only the benefits of reducing primary diesel PM emissions, the cost effectiveness of the proposed ATCM ranges between $10 to $20 per pound of diesel PM reduced. Additional benefits are expected to occur due to the reduction in reactive organic gases (ROG) and oxides of nitrogen (NO_x) emissions, but are not quantified in this analysis due to insufficient data. Table VIII-4 compares the cost effectiveness of the proposed ATCM with that of the Proposed Stationary Compression Ignition Engines ATCM and the recently adopted On-Road Heavy-Duty Residential and Commercial Solid Waste Collection Vehicles Control Measure.

Table VIII-4

Cost-Effectiveness Comparison - TRU ATCM and Two Other Diesel PM ATCMs

Regulation	Cost Effectiveness
Proposed TRU ATCM (Adoption Hearing Scheduled for December 11, 2003)	$10-$20 per pound of diesel PM reduced
Proposed Stationary Compression Ignition Engines ATCM (Adoption Hearing Scheduled for November 20, 2003)	$4-$26 per pound of diesel PM reduced
On-Road Heavy-Duty Residential and Commercial Solid Waste Collection Vehicles Control Measure (Adopted September 25, 2003)	$67 per pound of diesel PM reduced

(ARB, 2003a; ARB, 2003b)

Further information regarding the assumptions and methodologies used to estimate the proposed ATCM's costs and economic impacts is provided in the remainder of this chapter and in Appendix G of this Staff Report.

B. Analysis of Potential Impacts to State and Other Agencies

1. Legal Requirements Applicable to the Economic Impact Analysis

Government Code Section 11346.3 requires State agencies (including ARB) to evaluate the potential for adverse economic impacts on California businesses and individuals when proposing to adopt or amend any administrative regulation, including a regulation such as the proposed ATCM. The evaluation must include the impact of the proposed regulation upon California jobs, business expansion, elimination, or creation; and businesses' ability to compete with those of other states.

Health and Safety Code Section 57005 further requires the ARB to perform an economic impact analysis of submitted alternatives to a proposed regulation before the adoption of any major regulation. A "major regulation" is defined as a regulation that would potentially cost California businesses more than 10 million dollars in any single year. Since the proposed ATCM is expected to cost California businesses more than 10 million dollars in a single year, an economic analysis of alternatives to the proposed regulation is provided in Section D of this chapter.

In addition, Government Code Section 11357 and guidelines adopted by the Department of Finance (DOF) require the ARB and other State agencies to estimate a proposed regulation's associated cost or savings to any local, State, or Federal agency. The agency proposing a regulation is also required to determine whether, as a result of the regulation, any cost to local agencies or school districts is reimbursable by the State. Pursuant to Government Code Section 17566, any cost to school districts, transit agencies, or other local public agencies as a result of the proposed ATCM would not be reimbursable because private sector businesses would be subject to the same requirements and costs (ARB, 2002).

Local municipalities or school districts that operate TRUs may experience compliance costs to the extent that they own and/or operate TRUs and facilities visited by TRUs. Examination of Department of Motor Vehicles (DMV) records indicates that there is a very small number (less than 1,000) of TRUs owned by local municipalities or school districts statewide. The proposed rulemaking does not constitute a reimbursable mandate because the proposed regulation applies to all entities that are visited by or operate TRUs in the state and does not impose unique requirements on local agencies (County of Los Angeles vs. State of California, 43Cal 3d 46 [Jan 1987]).

2. Costs to ARB

One-time expenses for compliance education and outreach efforts before the regulation takes effect in the amount of $6,500 to $12,000 (itemized in Appendix G, Section A) will be absorbed within existing budgets and resources. The compliance date for facility reporting is Jan. 31, 2005. The cost of the ARB's enforcement efforts will also be absorbed within existing budgets and resources.

3. Costs to Other State Agencies

An extremely small number of TRUs are operated by state agencies. The State of California Department of General Services (DGS), Office of Fleet Administration (OFA), was contacted to determine the quantity of TRUs operated by state agencies. OFA does not maintain records that show the number of TRUs operated by state agencies. In normal situations, all state motor vehicle purchases are handled by the DGS Procurement Division (PD). PD was contacted to determine the quantity of TRU-equipped trucks and trailers purchased for state agencies in the last five years. Less than 12 TRUs were purchased in the time period from 1996 – 2001.

Department of Motor Vehicle records were also examined to determine the number of TRUs that might be operated by state agencies. While the number of vehicles with Fee-Exempt license plates can be identified, DMV records are not detailed enough to show the exact number of state-owned trucks and trailers that have TRUs and are subject to the regulation.

Based on the above information, we believe that the number of TRUs operated by state agencies is very small and therefore any compliance costs will have a negligible impact on other State agencies.

4. Costs to Other Governmental Agencies (Other Than State Agencies)

Other agencies not included in previous categories include school districts, as well as Federal and local governmental agencies. Staff has been unable to identify any TRUs operated by these districts and agencies; if any exist, staff is certain that they represent an insignificant portion of the total statewide TRU population.

C. Economic Impact Analysis

1. Assumptions Used in This Analysis

This analysis is performed in the year 2003, and unless otherwise stated, all costs are given in 2002 dollars. Where future costs are mentioned, they have been adjusted to 2002 dollars using standard accepted economic analysis procedures. A real interest rate of five percent (a 7 percent nominal rate minus an assumed 2 percent inflation rate) is used through out this analysis, unless otherwise noted.

Since this ATCM affects an extremely wide range of business types and sizes, the use of single cost figures or averages can be misleading, because business revenues, profit margins, and other financial characteristics can vary greatly between the different industry types within the range of affected businesses. For example, the business characteristics of a sole proprietor refrigerated trucking firm can vary greatly from those of a grocery distribution company or a cold storage warehouse. To recognize the distinctly different characteristics of the affected businesses, most costs used in this analysis are expressed as cost ranges.

Estimated costs for the ATCM are those within the 2004 – 2020 time period. This period was chosen to include the major portion of costs attributable to the ATCM. This time period (and the estimated costs) encompass all of the facility reporting and nearly all of the in-use (retrofit and operator reporting) compliance costs. The in-use compliance requirement starts in 2008 through 2020, affecting in rolling stages (compliance required seven years after the model year of the TRU) all TRUs through the 2013 model year. All 2014 and later model year TRUs (≥ 25 HP) are scheduled to meet the U.S. EPA Tier 4 standards, and are not affected by this ATCM.

Since the year 2008 has unusual circumstances, the ATCM cost for this year is treated differently than those for other years (2009 - 2020) of the analysis. In 2008, ATCM compliance costs are incurred, but there is no emission benefit attributable to the ATCM due to the December 31, 2008 compliance deadline; it is assumed that the majority of TRUs would not come into compliance until close to the deadline, producing negligible emission reductions attributable to that year. Because of this, it is not possible to calculate a cost-effectiveness figure for this year. However, the 2008 cost is valid and its effect is considered in the cost calculations. The 2008 cost is taken into consideration by converting it to 2009 dollars, and then converting that amount into a uniform payment series, which is then added to the annual costs for each of the years from 2009 - 2020. This conversion process for the 2008 cost is also done for the 2005 - 2008 costs for the Engine/TRU Replacement scenario.

Initial (or capital) costs, as discussed in this chapter, are the up-front costs of a compliance technology. These costs include items such as emission control devices, other components needed for the installation and functioning of such devices, and installation labor. A business may choose to pay the initial costs as a lump sum or one-time payment, or may decide to borrow funds. Since the cost of borrowing funds is higher than assuming a one-time payment, this analysis assumes that businesses will borrow funds to pay for the initial cost of compliance. The initial costs are expressed as a uniform series of payments over the assumed 10-year life of the compliance technology, at a real interest rate of 5 percent. Because the operator reporting cost is assumed to be a one-time cost, it is included in the initial cost.

Annual costs are those attributable to the ongoing operation of the compliance technology; maintenance and items that are consumed during normal operation (such as fuel-borne catalyst). The annual costs are variable, depending upon the amount of usage. For this reason, in the cost-estimate matrices in Appendix G, annual usage (and corresponding cost) figures of 1,100, 1,200, & 3,000 hours are used, representing typical usage for TRU generator sets, TRUs in short-haul operation, and long-haul operation, respectively. Since this analysis assumes the initial cost is financed, the annual cost also includes a payment towards the initial cost.

For the oldest in-use TRUs, compliance with LETRU standards must be achieved in 2008 and 2009, and, if still in service seven years after the corresponding compliance year, must meet ULETRU standards. This amounts to paying compliance costs twice for a given TRU. At the time these oldest units must comply with ULETRU standards, years 2015 and 2016, these TRUs will be a minimum of 14 years old, which is well past the average TRU life of 10 years. Since the majority of these older TRUs will have been replaced, and the remainder close to the end of their service life, staff anticipates that very few or none of the affected businesses will choose to pay the cost of ULETRU compliance. For this reason, the cost of ULETRU compliance for those TRUs having to meet LETRU standards is assumed to be zero.

Given that the last TRUs required to comply with the in-use provisions of the regulation (from Model Year 2013) will do so in the year 2020, to do a complete analysis of costs

requires examining costs out to the 10-year point, starting with the compliance year. In this case, this would mean extending the analysis period out to the year 2029. Since both cost and emission reduction estimates are needed for cost-effectiveness analysis purposes, and emission reduction estimates for the years 2021 – 2029 are not currently available, costs for the 2021 – 2029 time period were not included, nor were the emission benefits included in the estimates for the ATCM's total cost and cost-effectiveness figures. This same methodology was also followed for the cost-effectiveness calculations for the two alternatives in Section D.

Although the facility reporting cost is expected to be incurred by businesses in the 2004 calendar year, it has been included in the total cost calculations, expressed as an annual cost range over the thirteen-year analysis period (2008 – 2020.) The facility reporting cost has not been included in the cost-effectiveness calculations, to maintain consistency with the analysis procedures used in other similar ATCMs, such as those for Limiting School Bus Idling and Idling at Schools, On-Road Heavy-Duty Residential and Commercial Solid Waste Collection Vehicles, and Stationary Compression Ignition Engines.

The purpose of the facility reporting requirement of this ATCM is to gather additional information to determine the need for additional future regulation or control of this emission source category. This information-gathering work is typically performed during the development of an ATCM; despite the persistent and exhaustive efforts of ARB staff, affected stakeholders did not voluntarily provide requested information, thereby necessitating its request through regulatory means.

Since the costs associated with the facility reporting requirement are normally attributed to the regulatory development process, they are not usually quantified nor included in the cost of an ATCM. However, due to the unique circumstances encountered with the development of this ATCM, the facility reporting costs are quantified and reported in this analysis. These reporting costs are included in the reported total cost of the ATCM, but are excluded from the reported cost-effectiveness figures, in keeping with the methodology used for similar ATCMs.

In comparing the VDECS Retrofit and Engine/TRU Replacement scenarios for the in-use compliance cost estimate in the next section, it is assumed that both strategies produce an equal PM emission reduction benefit. For the VDECS Retrofit scenario, the costs discussed are those over and above the cost of the diesel technology currently in use. The Replacement scenario assumes that some TRU operators will replace their TRUs (or TRU engines) earlier than normal, due to the ATCM. Since an average TRU life of 10 years is assumed, along with an ATCM-mandated replacement of seven years, 40 percent of the replacement cost of the engine (for TRUs 10 years old and newer) and 15 percent of the TRU replacement cost (for TRUs 11 years and older) was attributed to accelerated replacement due to the ATCM. For TRUs that are 10 years old and newer, a feasible PM emission reduction strategy is replacing an existing engine with an engine meeting current standards. However, for TRUs older than 11 years, due to physical compatibility considerations, replacing existing engines in TRUs with new

engines is not generally considered feasible. Under the Replacement scenario, it is assumed that these older TRUs would be replaced with new TRUs.

These cost estimates are based on current and known technology; staff believes that it is likely that the costs will decrease as technology improves and production and sales volumes increase. The impact of VDECS certification costs upon in-use compliance technology costs to the end users will vary according to product sales volumes and the degree of certification testing required for a given product. Compliance technology costs used in this staff report reflect manufacturers' best-estimated retail product costs.

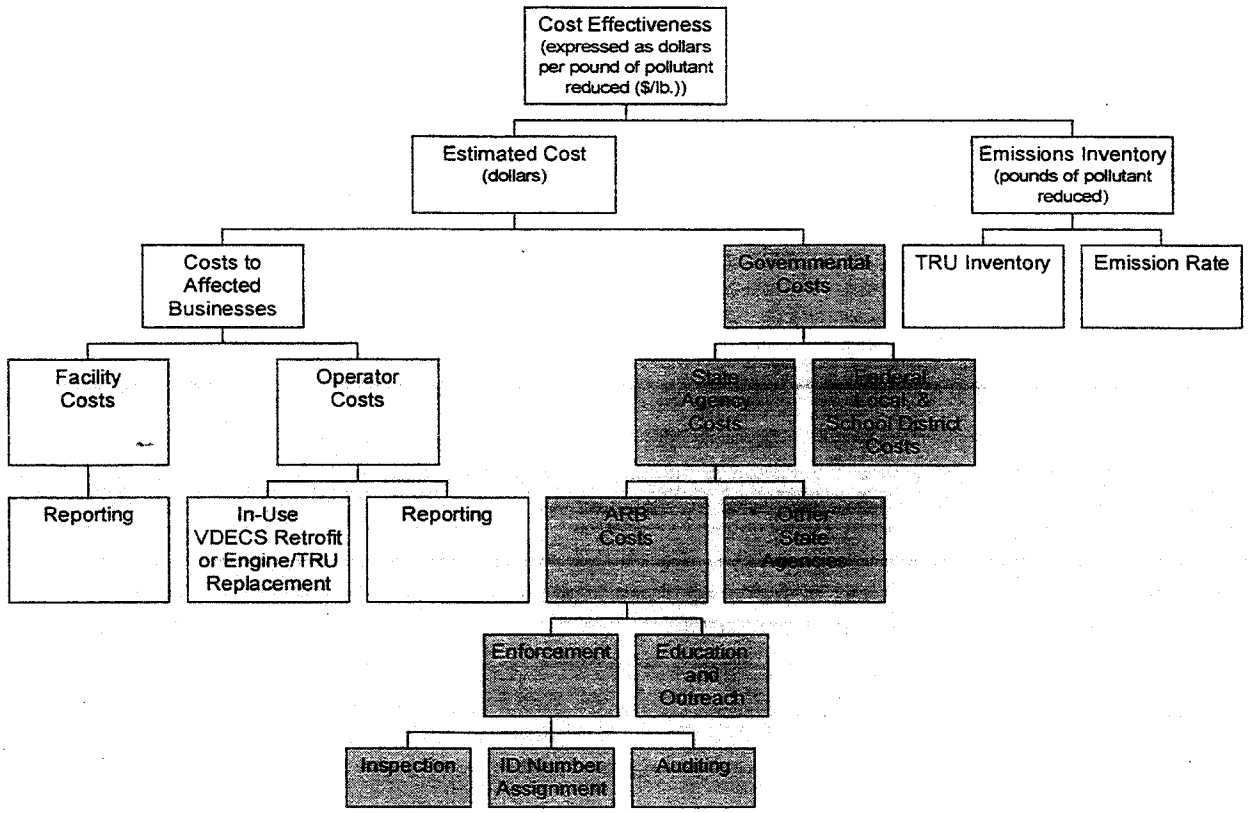
2. Cost Discussion

Businesses with California facilities visited by TRUs and/or operating TRUs in California will incur compliance costs as discussed below, to the extent that they have operations that meet the applicability requirements in this ATCM. Examples of these businesses (which may include governmental entities to a minor degree) include but are not limited to the following: wholesale food distribution & storage warehouses, perishable food production/processing facilities, and refrigerated/frozen product transportation services. The total number of businesses affected by the ATCM is estimated at 4,700 – 10,000, including those located outside California.

Figure VIII-1 illustrates the relationship between the various cost categories and their use in generating the ATCM's cost effectiveness estimates. Only the costs incurred by businesses are discussed in this section; costs to governmental agencies (shaded boxes) are discussed in Section B of this chapter and Appendix G. The emissions inventory (including TRU population figures) is discussed in detail in Chapter V and Appendix D.

Figure VIII-1

Cost Analysis Overview



The total cost estimate (using the VDECS Retrofit scenario) is $5.0 million - $14 million per year over a 13-year period (2008 –2020), with a total ATCM cost within the range of $87 million - $156 million. These figures are composed of the facility reporting and operator costs as discussed below. The cost –effectiveness figures in Section D are calculated using only the operator costs; a full discussion of the rationale for this convention is in that section.

The ATCM requires TRU operators to meet performance standards. Although the median TRU life is estimated at about 10 years, the ATCM seeks emission benefits by accelerating attrition of older TRUs and requiring in-use TRUs to meet lower emission performance standards. The standards can be met by using any of a variety of compliance options appropriate for their business situation. These options include accelerated attrition (early replacement) of the TRU, engine replacement, emission control retrofit, and alternative (non-diesel) technology use. Added flexibility in complying with the ATCM's provisions is extended to those operators who meet regulatory requirements earlier than mandated and will likely result in lower compliance costs.

In this analysis, all of the VDECS Retrofit cost is included in the total cost figure for the ATCM, since the sole reason for retrofit would be compliance with this ATCM. For the Replacement scenario, 15 percent of the new TRU cost and 40 percent of the engine replacement cost is assigned to the ATCM. This cost prorating is done to reflect the ATCM's accelerated attrition effect on the TRU fleet—businesses that normally replace TRUs after 10 years would have to do so (or perform an engine replacement or VDECS retrofit) at the seven-year point. It is not appropriate to assign the entire cost of engine/TRU replacement to the ATCM, since businesses purchase TRUs or replace engines as a normal business practice.

Due to the large size of the matrices used to prepare the costs estimates, they are located in Appendix G.

2.1. Facility Reporting Cost

Facilities meeting the eligibility criteria in the ATCM will need to submit a one-time report to ARB by January 31, 2005. The eligibility criteria exclude smaller businesses from the facility reporting requirement. From Appendix G, Section, B.1.2., it is estimated that 2,705 California facilities will be subject to the reporting requirement. The cost of this requirement is expected to be incurred by businesses in 2004, to meet the report submission deadline of January 31, 2005.

The physical facility information requested (number of refrigerated doors, etc.) is information familiar to the facility operations manager or equivalent personnel. It is estimated that this information will take 30 minutes to assemble and record on the reporting form. Assuming a labor rate of $40.00/hour, this cost is estimated at $20 per facility.

The cost of TRU engine run time and other load-specific information requested will vary depending upon the volume of refrigerated load activity at a facility. Since all facilities have existing logging procedures for refrigerated load arrival and departures, it is assumed that this would be the most logical point at which to capture the requested information. Depending on facility preference and volume of activity, load-specific information could be recorded by hand using logging sheets, written on existing paperwork such as bills of lading, or tracked by computer. All of this information would have to be compiled at regular intervals for submission. It is assumed that smaller facilities or those not currently using computers to track goods movement would not start using computers and would track load-specific information by hand. Those facilities currently using computers to track goods movement are assumed to use existing computer systems to track the requested load-specific information.

The assumptions used to estimate this cost range are as follows:

- ✓ Estimated range of refrigerated load activity: 2 – 500 per week, or 104 – 26,000 per year

- ✓ Manual recording of load-specific information: 5 minutes per load
- ✓ Computer recording of load-specific information: 2 minutes per load
- ✓ Manual compiling of information: 120 minutes
- ✓ Retrieval of computer report for compilation: 60 minutes

It is also assumed that manual recording and compilation will be used for facilities at the lower end of the range, and computer recording will be used for facilities at the high end of the range. Using the assumptions given, and a labor rate of $40.00/hour, the costs are as follows:

Low End of Facility Reporting Cost Range

Assuming Manual Recording of Information:

Providing Instruction to Staff:	2 Hrs.
Modification of Tracking System to Capture Load-Specific Information:	4 Hrs.
Physical Facility Information	0.5 Hrs.
104 Refrigerated Loads/year @ 5 min. recording time/load:	8.67 Hrs.
Compilation of load-specific information, per year:	2 Hrs.
Total:	**17.2 Hours**

17.2 Hours @ $40.00/Hour = $688

High End of Facility Reporting Cost Range

Assuming Computer Recording of Information:

Providing Instruction to Staff:	3 Hrs.
Modification to Computer System to allow tracking of load-specific information:	8 Hrs.
Physical Facility Information	0.5 Hrs.
13,000 Refrigerated Loads/year @ 2 min. recording time/load:	433 Hrs.
Compilation of load-specific information, per year:	2 Hrs.
Total:	**446.5 Hours**

446.5 Hours @ $40.00/Hour = $17,860

The cost range for an individual facility report is therefore $688 – $17,860 ($700 – $18,000, rounded). The high end of the range represents the very largest high-volume facilities in California, and the reporting costs represent a very small percentage of their operating revenue.

Multiplying the low and high end of this range by the number of facilities (2,705, from Appendix G, Section B.1.2.) will give the range of reporting costs for those facilities subject to the reporting requirements: $1,861,040 - $48,311,300. Converting this range to a uniform series of payments over the thirteen-year analysis period gives an annual facility reporting cost of $198,200 - $5,145,135 ($200,000 - $5.2 million, rounded.)

2.2. VDECS Retrofit Scenario

VDECS is believed to be the most likely in-use compliance approach. This scenario assumes low- and high-cost business situations to construct a range of likely in-use costs. The first two scenarios listed in Matrix 1 (Appendix G) contain the estimated in-use ATCM compliance cost range. The low-end scenario assumes 1,200 hours per year (typical short-haul duty) TRU operation, with the use of fuel-borne catalyst (FBC) and a catalyzed wire mesh filter (CWMF) for LETRU compliance and liquefied-petroleum gas (LPG) dual-fuel pilot injection for ULETRU compliance. The high-end scenario assumes 3,000 hours per year (typical long-haul duty) TRU operation, with the use of fuel-borne catalyst (FBC) and a catalyzed wire mesh filter (CWMF) for LETRU compliance and liquefied-petroleum gas (LPG) dual-fuel pilot injection for ULETRU compliance. Both scenarios assume that TRU generator sets are operated 1,100 hours per year. Under each scenario, it is assumed that the listed technologies will be used by all of the in-use TRUs.

The statewide total costs include the following:

	Low	High
Annual In-Use Compliance Cost (from Matrix 2, low- & high-cost scenarios) (includes in-use compliance costs, annual operator reporting costs, and 2008 adjustment)	$4,834,485	$8,986,214
Facility Reporting Cost		
Low End (annualized):	$198,200	
High End (annualized):		$5,145,153
Range of Annual Estimated Cost:	$5,032,685	$14,131,367
Range of Annual Estimated Cost (rounded):	**$5,000,000**	**$14,000,000**

This is the annual total cost range for the 13-year phase-in period (2008 – 2020) of the regulation. From Matrix 2 (Appendix G), the lifetime (2008-2020) statewide total cost range is $87 million – $156 million.

2.2a. Engine/TRU Replacement Scenario

Under this scenario, it is assumed that engine and TRU replacement would be used to achieve ATCM compliance for in-use units. This analysis is performed as a back-up to the VDECS Retrofit scenario. This scenario considers the cost of engine/TRU

replacement only, and does not include the cost of truck or trailer replacement. Table VIII-1 lists the engine/TRU replacement costs.

Since engine replacement is only a feasible emission reduction strategy for those units 10 years old and newer, it was assumed that this would be only done for these units. For units 11 years and older, it was assumed that these units would be replaced with new. In both situations, since the unit would be approaching the end of its useful life, it was assumed that only a fraction of the replacement cost would be attributable to the ATCM. The reason for this is that businesses would normally set aside funds for TRU replacement, and the ATCM would accelerate the replacement cycle. For those units 10 years old and newer, this fraction was set at 0.40. For the 11 year and older units, the fraction was set at 0.15. Using the same methodology as for the VDECS Retrofit scenario calculations, from Matrix 2a (Appendix G), the ATCM cost was estimated at $89 million - $156 million over the 13-year phase-in period of the ATCM with an annual cost in the range of $5.8 million - $14 million. Thus, the total and annual cost estimate for the ATCM remain about the same whether the VDECS Retrofit or Engine/TRU Replacement scenarios are used.

2.3. Operator Reporting Cost

All TRU operators that meet the reporting requirement criteria as outlined in the ATCM must file a report with ARB by January 31, 2009. Any subsequent changes to the reported information must be submitted to ARB as they occur. Since the extent to which businesses will submit updated information to ARB is unknown, the cost of updates is not included in this analysis; update costs are expected to be minor, given the brief amount of information requested in the initial report.

Operator reporting requirements are estimated to be relatively minor, since most of the information requested by ARB is contained in records already normally maintained by businesses, such as the number of TRUs operated by the business, TRU make(s) and model(s), etc.

The number of TRU operators multiplied by the estimated reporting cost will give the total statewide cost of the operator reporting requirement. The estimated number of businesses that operate TRUs in California (including out-of-state businesses operating TRUs in California) is the range from 1,969 – 7,332 (from Table G-2, Appendix G); and the estimated per-business cost range is $40 - $320, given an hourly labor rate of $40 per hour and a range of one to eight hours to gather the information and submit it to ARB. Using these figures, the statewide range of the operator in-use reporting cost is $78,760 – 2,346,240 ($80,000 - $2.4 million, rounded).

2.4 Operator Cost Total

The total cost of compliance to a TRU operator is the sum of the VDECS Retrofit cost and the Operator Reporting cost from the preceding two Sections (C.2.2. & C.2.3.). Matrix 2 (Appendix G) lists the sum of these two costs on an annual basis, and also

includes the 2008 cost adjustment as discussed earlier in Section C.1. The total statewide operator cost range is $4.8 – $9.0 million annually for the years 2009 – 2020, with the total for all of these years being $84 million - $89 million. These figures do not include the facility reporting cost discussed earlier

2.5. Small Business Costs

From Appendix G, Table G-1, TRU operators with 20 or fewer TRUs would fall into the small business category. It is estimated that 81 percent of the total number of affected businesses would be in this category. Applying this percentage to the total number of businesses operating TRUs gives the number of small businesses operating TRUs, which is expressed as the range 1,595 – 5,939.

Small businesses may be subject to the In-Use and Operator Reporting Requirements and are excluded from the Facility Reporting Requirement. The exact compliance cost will depend upon the compliance technology chosen and the number of TRUs operated by a business. Assuming a range of one to 20 TRUs operated by a small business, and given the annualized capital and maintenance costs from Matrix 1 (Appendix G), the initial costs are estimated as follows:

	Low	High
Initial Operator In-Use Compliance Costs[5]		
Low End (one TRU using the low-cost scenario from Matrix 1) ($265 annualized capital cost):	$265	
High End (20 TRUs using the high-cost scenario from Matrix 1) ($265 annualized capital cost times 20 TRUs):		$5,300
Operator Reporting Cost		
For this range of TRU business size, it was assumed that this cost would be constant.		
One hour to prepare report x $40.00/hr.:	$ 40	$ 40
Range of Initial Small Business Compliance Costs:	$305	$5,340
Range of Initial Small Business Compliance Costs (rounded):	**$300**	**$5,300**

[5] This estimate assumes that the initial (capital) costs will be financed- the amount shown is the first in a series of annual payments for 10 years.

For the annual ongoing costs for a small business, it was assumed that a small business operator would have between one to twenty TRUs, and given the annualized capital and maintenance costs from Matrix 1 (Appendix G), the annual costs can be estimated as follows:

	Low	High
Annual Operator In-Use Compliance Costs[6]		
Low End (one TRU using the low-cost scenario from Matrix 1) ($265 annualized cap. cost plus $107 annual maint. cost):	$372	
High End (20 TRUs using the high-cost scenario from Matrix 1) (($265 annualized cap. cost plus $291 annual maint. cost) times 20 TRUs):		$11,120
Range of Annual Small Business Compliance Costs:	$ 372	$11,120
Range of Annual Small Business Compliance Costs (rounded):	**$ 400**	**$11,000**

2.6. Typical Business Costs

Subtracting the number of small business TRU operators from the total number of TRU operators will give the number of typical businesses that operate TRUs, defined as operators with 21 or more TRUs. Using the percentage of small businesses (TRU operators) from Appendix G, Table G-1, It is estimated that 19 percent (100 percent total minus 81 percent small businesses) of the affected businesses would be considered typical businesses. Applying this percentage to the total number of TRU operators gives the number of typical businesses operating TRUs, which is expressed as the range of 374 – 1,393.

The exact compliance cost will depend upon the compliance technology chosen and the number of TRUs operated by a typical business. Assuming a range of 21 to 250 TRUs operated by a typical business, and given the annualized capital and maintenance costs from Matrix 1 (Appendix G), the initial costs are estimated as follows:

[6] Includes annual finance payment for initial cost.

	Low	High
Initial Operator In-Use Compliance Costs[7]		
Low End (21 TRUs using the low-cost scenario from Matrix 1) ($265 annualized capital cost x 21 TRUs):	$5,565	
High End (250 TRUs using the high-cost scenario from Matrix 1) ($265 annualized capital cost x 250 TRUs):		$66,250
Operator Reporting Cost (from Section C.2.4.)		
Low End	$40	
High End		$320
Range of Initial Typical Business Compliance Costs:	$5,605	$66,570
Range of Initial Typical Business Compliance Costs (rounded):	**$5,600**	**$67,000**

To estimate the annual ongoing costs for a typical business, it was assumed that a business operator would have between 21 to 250 TRUs. Using this range, and given the annualized capital and maintenance costs from Matrix 1 (Appendix G), the costs are estimated as follows:

	Low	High
Annual Operator In-Use Compliance Costs[8]		
Low End (using the low-cost scenario from Matrix 1) (($265 annualized capital cost plus $107 annual maintenance cost) x 21 TRUs):	$7,812	
High End (using the high-cost scenario from Matrix 1) (($265 annualized capital cost plus $291 annual maintenance cost) x 250 TRUs):		$139,000
Range of Annual Typical Business Compliance Costs:	$7,812	$139,000
Range of Annual Typical Business Compliance Costs (rounded):	**$7,800**	**$139,000**

D. Cost-Effectiveness Analysis of the Proposed ATCM

Health and Safety Code Sections 39658 & 39665 through 39667 require the Air Resources Board to determine the need and appropriate degree of regulation for substances identified as toxic air contaminants. This proposed ATCM is the result of this process, as applied to diesel engine exhaust particulate matter (diesel PM) emissions from TRUs.

[7] This estimate assumes that the initial costs will be financed- amount shown is the first in a series of annual payments for 10 years.
[8] Includes annual finance payment for initial cost.

The proposed ATCM applies to existing businesses and uses existing technologies. It may lead to the creation or elimination of businesses. Due to the long lead time given for compliance and a wide range of compliance options, staff believes that most businesses will be able to meet the compliance costs. However, it is possible that a small number of businesses (those with marginal profitability) may have difficulty in complying with the ATCM. Staff believes that this ATCM may lead to the alteration of job duties within existing businesses, as well as a small increase in new jobs due to the creation of business opportunities as discussed below. This may be offset by the loss of a few businesses (and attendant jobs) that are unable to comply with the ATCM. Staff believes that there will be little or no significant change in the total number of businesses or jobs.

Businesses that may be created include those that furnish, install, and maintain diesel emission control systems, as well as those that provide alternative (non-diesel) in-use compliance strategies. Engine manufacturers, TRU manufacturers, and TRU sales and service dealers are likely to see an increase in business due to accelerated attrition and implementation of other compliance options to meet the in-use requirements of the ATCM.

The proposed ATCM applies to all TRU operators in California. Thus, it would not disadvantage California operators over out-of-state operators. The affected facilities are all local businesses and are not subject to competition from similar businesses in other states. An insignificant number of facilities located close to the California border may relocate out of state.

Economic productivity may be reduced as businesses devote labor and capital to comply with the ATCM. Individuals may be impacted to the extent that affected businesses are able to pass on the compliance costs to their customers.

1. Estimated Benefits

All Californians will benefit from the decreased exposure to diesel PM, identified by the State of California as a toxic air contaminant, with resultant decreases in incidences of cancer, PM-related cardiovascular effects, chronic bronchitis, asthma, and hospital admissions from pneumonia, asthma-related conditions, and other health effects. Additional health benefits are expected (but not quantified in this analysis) from reductions in NO_x emissions, which are precursors to secondary PM.

Implementation of the ATCM is estimated to produce a reduction of 383,000 to 592,000 pounds (192 – 296 tons) of diesel PM (Appendix D) in California annually during most (years 2009 – 2020; zero PM reduction is calculated for year 2008, due to the in-use compliance date of December 31, 2008) of the phase-in period of the ATCM. The total estimated PM reduction over the lifetime (2008 – 2020) of the ATCM is 6,000,000 pounds (approximately 3,000 tons), which translates into an estimated 211 premature deaths avoided by the year 2020.

The cost range per death avoided is 8 to 22 times lower than the U.S. EPA's benchmark for value of avoided death. Therefore, this ATCM is considered a cost-effective mechanism to reduce premature deaths that would otherwise be caused by diesel PM emissions without this ATCM. Please refer to Chapter IX for a more complete discussion of the heath benefits attributable to this ATCM.

2. Comparison of ATCM to Alternatives

The analysis in this section does not include the facility reporting cost. The facility reporting cost was not included to keep the cost-effectiveness calculation methodology consistent with that of other similar ATCMs, such as those for Limiting School Bus Idling and Idling at Schools, On-Road Heavy-Duty Residential and Commercial Solid Waste Collection Vehicles, and Stationary Compression Ignition Engines. However, the facility reporting cost is included in the total cost figure in Section C. Each cost quoted below is an annual cost range, in year 2002 dollars, for the 13-year phase-in period of the ATCM.

The alternative technologies used in this comparison were chosen from the technology matrix in Chapter VI and Appendix B, for their relatively greater estimated PM emission reductions.

2.1. TRU ATCM Cost

The annual regulation cost is the sum of the in-use compliance cost and the operator reporting cost: $4,834,485 - $8,986,214 (from Matrix 2, Appendix G) ($4.8 million – $9.0 million, rounded). The PM emission reduction attributable to the ATCM are within the range of 383,000 to 592,000 pounds per year for the years 2009 – 2020, for a total of six million pounds for the same period. Although the in-use compliance requirement starts in 2008, there is no PM emission benefit in that year (see discussion in Section C.1.). Therefore, a cost-effectiveness figure for that year cannot be calculated. However, the year 2008 cost is spread out over the 2009 – 2020 analysis period and is therefore included in both the total and annual costs (and consequently, the cost-effectiveness figures) for the ATCM.

2.2. Alternative 1 Cost

The annual cost for alternative 1, 100 percent use of electricity for TRU refrigeration at facilities (electric standby), is $26,453,816 – $48,894,414 (from Matrix 3, Appendix G) ($27 million – $49 million, rounded).

The calculations for the relative emission reduction effectiveness of this alternative as compared to the ATCM are shown in Matrix 3. An emission reduction of 50 percent of the baseline was assumed, since use of electric power while at a facility produces zero diesel PM emissions, TRU engine operation while moving will still produce PM emissions. The emission reduction of 50 percent of baseline TRU emissions was attributed to use of electric power for the TRU while at a facility, and was divided into

both the low-end and high-end emission reductions attributable to the regulation to give the relative effectiveness of this alternative. The current statewide lack of appropriate support infrastructure (electrical hook-ups at facilities) and high cost are major factors that may preclude the use of this alternative on a statewide basis. However, in business circumstances amenable to this compliance technology, it may be feasible. One example where this technology may be feasible is in captive fleets where refrigerated vehicles travel over regular routes between company-controlled stops. In this situation, electric hook-ups for the TRUs may be provided at every stop.

For TRU generator sets only, the use of electricity is not considered a viable alternative technology, since a TRU generator set's function is to supply electrical power to a TRU and an electrical hookup at a facility is not a practical substitute for a generator set while a TRU is moving. To reflect this assumption, Matrix 3 (and the analysis) does not show an emission reduction for the application of this alternative to TRU generator sets. The annual PM emission reduction attributable to this alternative is within the range of 189,800 to 748,250 pounds.

2.3. Alternative 2 Cost

The annual cost for alternative 2, 100 percent use of cryogenic technology for TRU refrigeration at facilities, is $105,259,952 – $186,955,416 (from Matrix 4, Appendix G) ($105 million – $187 million, rounded).

The calculations for the relative emission reduction effectiveness of this alternative as compared to the ATCM are shown in Matrix 4. An emission reduction of 100 percent of the baseline was assumed, since the use of cryogenic technology produces zero diesel PM emissions under all situations. The emission reduction of 100 percent of baseline TRU emissions was divided into both the low-end and high-end emission reductions attributable to the regulation to give the relative effectiveness of this alternative. While the elimination of diesel PM emissions associated with this technology is highly desirable, it should be noted that the lack of appropriate support infrastructure in some geographic areas and high cost would likely prevent statewide use of this alternative. However, this compliance technology may be feasible in niche markets where business circumstances are favorable to this technology.

For TRU generator sets only, the use of cryogenic technology is not considered a viable alternative, since cryogenic technology is intended to replace the refrigeration function of a TRU and is not suitable for replacing the electrical-power generation function of a TRU generator set. To reflect this assumption, Matrix 4 (and the analysis) does not show an emission reduction for the application of this alternative to TRU generator sets.

The annual PM reduction attributable to this alternative is within the range of 327,040 to 1,368,750 pounds for the period from 2008 – 2020.

A summary of the cost-effectiveness (expressed in dollars per pound of PM reduced) comparison between the ATCM and the two alternatives is shown in the table below:

Table VIII- 5

Cost-Effectiveness Comparison – ATCM and Selected Alternatives

	Annual PM Emission Reduction	Annual Cost (facility reporting cost not included) ($)	Annual Cost Effectiveness ($/lb. PM avoided)
ATCM - VDECS Retrofit - Engine/TRU Replacement	383,000 – 592,000	4.8 million – 9.0 million	10 – 20 (rounded)
Alternative 1 - Electric Standby	189,800 – 748,250	32 million – 57 million	52 – 231
Alternative 2 - Cryogenic Technology	327,040 – 1,368,750	113 million – 198 million	24 – 366

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ARB, 2003b. California Air Resources Board. *Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Airborne Toxic Control Measure for Stationary Compression-Ignition Engines.* September 2003.

IX. ENVIRONMENTAL IMPACTS

The proposed Airborne Toxic Control Measure (ATCM) is intended to protect the health of California citizens by reducing exposure to emissions from diesel-fueled transport refrigeration units (TRUs) and TRU generator sets. An additional consideration is the impact the proposed ATCM may have on the environment. Based upon available information, the Air Resources Board (ARB or Board) staff has determined that no significant adverse environmental impacts should occur as the result of adopting the proposed ATCM. This chapter describes the potential impacts that the proposed ATCM may have on the environment (i.e., air, land and water), State Implementation Plan, near-source emissions, and environmental justice.

A. Legal Requirements

The California Environmental Quality Act (CEQA) and ARB policy require an analysis to determine the potential environmental impacts of proposed regulations. Because the ARB's program involving the adoption of regulations has been certified by the Secretary of Resources pursuant to Public Resources Code section 21080.5, the CEQA environmental analysis requirements may be included in the Initial Statement of Reasons (ISOR) for this rulemaking. In the ISOR, ARB must include a "functionally equivalent" document, rather than adhering to the format described in CEQA of an Initial Study, a Negative Declaration, and an Environmental Impact Report. In addition, staff will respond, in the Final Statement of Reasons for the ATCM, to all significant environmental issues raised by the public during the public review period or at the Board public hearing.

Public Resources Code section 21159 requires that the environmental impact analysis conducted by ARB include the following:

- An analysis of reasonably foreseeable environmental impacts of the methods of compliance;
- An analysis of reasonably foreseeable feasible mitigation measures; and
- An analysis of reasonably foreseeable alternative means of compliance with the ATCM.

Compliance with the proposed ATCM is expected to directly affect air quality and potentially affect other environmental media as well. Our analysis of the reasonable foreseeable environmental impacts of the methods of compliance is presented below.

Regarding mitigation measures, CEQA requires an agency to identify and adopt feasible mitigation measures that would minimize any significant adverse environmental impacts described in the environmental analysis.

The proposed ATCM is needed to reduce the risk from exposures to diesel PM as required by Health and Safety Code (H&SC) sections 39666 and 39667, and to fulfill the goals of the October 2000 Diesel Risk Reduction Plan. Alternatives to the proposed ATCM have been discussed earlier in Chapter VII of this report. ARB staff have concluded that there are no alternative means of compliance with the requirements of H&SC sections 39666 and 39667 that will achieve similar diesel PM emission reductions at a lower cost.

B. Effects on Ambient Air Quality

The proposed ATCM is expected to directly impact air quality and is designed to reduce the exposure to diesel PM emissions from in use TRUs and TRU generator set engines by requiring them to be retrofitted, replaced, or re-powered. TRUs and TRU generator sets emit diesel PM, nitrogen oxides (NOx), carbon monoxide (CO), reactive organic gases (ROG) along with several other pollutants that have the potential to cause cancer and other health effects.

The projected daily emissions of diesel PM and NOx from TRUs and TRU generator sets with implementation of the proposed ATCM is provided in Table IX-1 for the years 2010 and 2020. The year 2000 is considered to be the baseline year for these emissions. This data shows there would be a 0.4 tons per day PM emission reduction in 2010 compared to 2000 PM emissions, and similarly, a 1.7 tons per day reduction in 2020. There would be an increase in NOx emissions over time compared to 2000 because the TRU engine population increases at a faster rate than the amount of emissions reduced per engine. The net increase is attributed to the population growth outpacing the NOx reduction benefits of the ATCM and Tier 4 nonroad new engine standards.

Table IX-1
Projected Emissions with Implementation of the Proposed ATCM

Emission Year	Total Emissions (Tons per Day)	
	PM	NOx
2000[1]	2.0	19.1
2010	1.6	24.5
2020	0.3	28.2

1. This is the baseline year for these emissions.

Table IX-2 presents the projected emission reductions due to the proposed ATCM in 2010 and 2020 compared to 2008 (i.e., the year the proposed ATCM emission reductions would begin to be implemented). In 2008, only the Tier 4 nonroad/off-road new engine emission standards are considered. Staff

estimates that implementation of the proposed ACTM would reduce PM emissions from TRUs and TRU generator sets by approximately 0.6 tons per day in 2010, and 0.5 tons per day in 2020. Also, the ATCM would reduce NOx emissions by 0.9 and 1.0 tons per day for 2010 and 2020, respectively.

Table IX-2
Emission Benefits from Implementation of the Proposed ATCM

Emission Year	Total Emission Reductions (Tons per Day)	
	PM	NOx
2010	0.6	0.9
2020	0.5	1.0

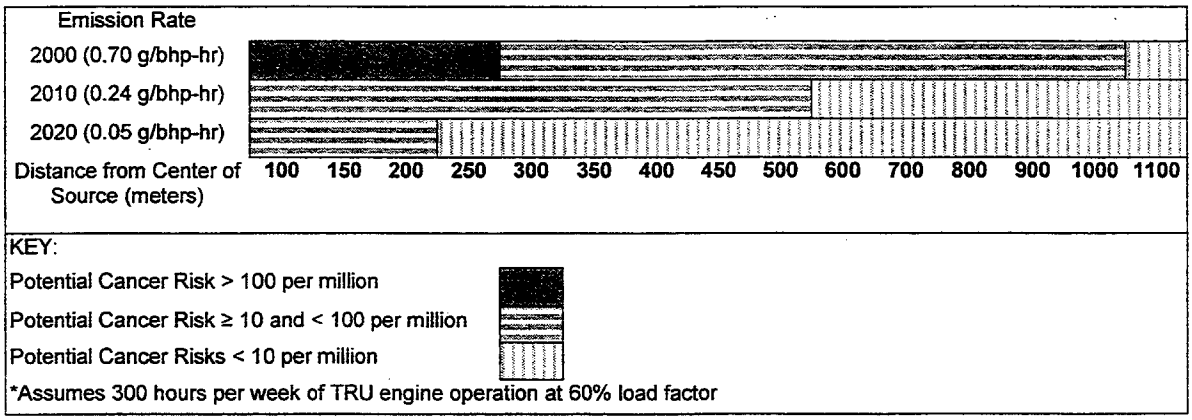
When the emission benefits are added up for the entire implementation period (2008 through 2020), the total PM emission reductions would be close to 3,000 tons. Appendix D discusses these emission reductions in more detail.

C. Near-Source Emission Impacts Due to Diesel TRU Engines

Exposure to diesel PM emissions from TRU engines is known to cause adverse health effects. In California, there are currently about 31,000 TRUs and TRU generator sets, 7,500 out-of-state refrigerated trailers, and 1,700 railcar TRUs operating at any given time. The highest concentrations of diesel PM from TRUs are expected to occur at locations where numerous TRUs operate (i.e. distribution facilities, ports, and intermodal facilities). Facilities where numerous TRUs operate could potentially result in significant potential health risk to individuals living near the facilities.

Reduction of potential cancer risk levels at locations where TRUs operate would be a direct result of the reduction in diesel PM emissions. Figure IX-1, below, compares the cancer risk range at various distances assuming 300 hours of TRU activity per week. For year 2000, the current fleet average emission rate of 0.7 g/bhp-hr was used. The average fleet emission rate is assumed to be 0.24 g/bhp-hr in 2010 and 0.05 g/bhp-hr in 2020. These emission rates assume compliance with the ATCM and the proposed U.S. EPA Tier 4 standards. Figure IX-1 also shows that the near source risk is significantly reduced (by approximately 92 percent) as the diesel PM emission rate is reduced from the current fleet emission rate to the much lower emission rate in 2020.

Figure IX-1
Estimated Risk Range versus Distance from Center of TRU Activity Area*



D. State Implementation Plan – Air Quality Benefit Analysis

The ARB *Proposed 2003 State and Federal Strategy for the California State Implementation Plan* (Proposed Strategy) describes defined State and federal measures that will reduce emissions and improve air quality statewide.

The identified measures will also help the South Coast air basin attain the federal ozone and PM standards by the applicable attainment dates. The measures identified by ARB staff and staff of the South Coast Air Quality Management District in the District's Air Quality Management Plan are estimated to achieve about one-third of the emission reductions needed to attain the 1-hour federal ozone standard in the Los Angeles area. To bridge the gap, the Proposed Strategy describes the need for additional emission reductions, beyond the defined measures, to attain the federal 1-hour ozone standard in the South Coast. We expect that the San Joaquin Valley will also need additional emission reductions to meet the 1-hour federal ozone standard. The ARB has already approved five of the defined strategies. The Board will consider the remaining defined strategies and the long-term strategy in Fall 2003.

ROG emission reductions, which would aid our ozone control strategy, can be realized from implementation of diesel particulate control strategies. In addition, reductions of direct emissions of diesel particulate will help decrease ambient particulate levels and make progress toward attainment of federal particulate matter standards in the South Coast and the San Joaquin Valley. Because this ATCM was still under development when the Proposed Strategy was released, it was not possible to project the expected ancillary ROG benefits of the control strategy. However, once an ATCM is adopted and the emission reductions are enforceable, ARB may claim any associated ROG benefits against the State Implementation Plan (SIP) commitments.

The ROG benefits of the proposed ATCM may vary significantly depending upon the compliance mechanism chosen by the regulated industry. Because of this uncertainty, ARB staff intends to closely monitor the implementation of the proposed ATCM to provide the most accurate estimate of ROG and PM reductions to credit toward the SIP obligations. As shown previously, Table IX-2 provides an illustration of the emission reductions that might accrue from the implementation of the proposed ATCM.

To meet ARB's legal obligation to provide for attainment, ARB staff will continue to pursue every available emission reduction opportunity. If ARB staff believes that it is technically and economically feasible to achieve more emission reductions from an individual measure than originally envisioned in the Proposed Strategy, we will do so. In addition, ARB plans to lead a multi-agency effort to identify, develop, adopt, and implement further control strategies, beyond those described in the Proposed Strategy.

E. Health Benefits of Reductions of Diesel PM Emissions

The emission reductions obtained from this ATCM will result in lower ambient PM levels and significant reductions of exposure to primary and secondary diesel PM. Lower ambient PM levels and reduced exposure, in turn, will result in a reduction of the prevalence of the diseases attributed to PM and diesel PM, including reduced incidences of hospitalizations for cardio-respiratory disease, and prevention of premature deaths.

Primary Diesel PM

Lloyd and Cackette (2001) estimated that, based on the Krewski et al. (2000) study[9], exposures of diesel $PM_{2.5}$ ambient concentrations at a level of 1.8 $\mu g/m^3$ resulted in a mean estimate of 1,985 cases of premature deaths per year in California. The diesel PM emissions corresponding to the direct diesel ambient population-weighted PM concentration of 1.8 $\mu g/m^3$ are 28,000 tons per year (ARB, 2000). Based on this information, we estimate that reducing 14.11 tons per year of diesel PM emissions would result in one fewer premature death (1,985 deaths*14.11 tons/28,000 tons). Comparing the $PM_{2.5}$ emission before and after this ATCM, the proposed ATCM is expected to reduce PM emissions by approximately 3,000 tons by the end of year 2020, and therefore prevent an

[9] Although there are two mortality estimates in the report by Lloyd and Cackette – one based on work by Pope *et al.* (1995) and the other based on Krewski *et al.*(2000) we selected the estimate based on the Krewski's work. For Krewski *et al.*(2000), an independent team of scientific experts commissioned by the Health Effects Institute conducted an extensive reexamination and reanalysis of the health effect data and studies, including Pope *et al.* (1995) The reanalysis resulted in the relative risk being based on changes in mean levels of $PM_{2.5}$, as opposed to the median levels from the original Pope *et al.* (1995) study. The Krewski *et al.*(2000) reanalysis includes broader geographic areas than the original study (63 cities vs. 50 cities). Further, the U.S. EPA has been using Krewski's study for its regulatory impact analyses since 2000.

estimated 211 premature deaths (103-318, 95 percent confidence interval (95% CI) by year 2020. Prior to 2020, cumulatively, it is estimated that 31 premature deaths (15-46, 95% CI) would be avoided by 2010 and 129 (63-194, 95% CI) by 2015. Additional health benefits are expected from the reduction of NOx emissions, which give rise to secondary PM from the conversion of NOx to $PM_{2.5}$ nitrate.

To estimate the cost of control per premature death prevented, we multiplied the estimated tons of diesel PM that would result in one fewer premature death (14.11 tons per year) by the average present value of cost-effectiveness ($10 to $20 per pound of PM range or $20,000 to $40,000 per ton). The resulting estimated cost of control per premature death prevented ranged from $282,000 to $564,000 in 2002 dollars. The U.S. EPA has established $6.3 million (in year 2000 dollars) for a 1990 income level as the mean value of avoiding one death (U.S. EPA, 2003). As real income increases, the value of a life may rise. U.S. EPA further adjusted the $6.3 million value to about $8 million (in 2000 dollars) for a 2020 income level. Assuming that real income grew at a constant rate from 1990 and will continue at the same rate to 2020, we adjusted the value of avoiding one death for the income growth. Since the control cost is expressed in 2002 discounted value, accordingly, we discounted values of avoiding a premature death in the future back to the year 2002. In U.S. EPA's guidance of social discounting, it recommends using both three and seven percent discount rates (U.S. EPA, 2000). Using these rates, and the annual avoided deaths as weights, the weighted average value of reducing a future premature death discounted back to year 2002 is $3.5 million at seven percent discount rate, and $5.6 million at three percent. The cost range per death avoided because of this proposed regulation is 8 to 22 times lower than the U.S. EPA's benchmark for value of avoided death. This rule is, therefore, a cost-effective mechanism to reduce premature deaths that would otherwise be caused by diesel PM emissions without this ATCM.

The benefits of reducing diesel emissions are based on a statewide average diesel emission value, such as in the Lloyd and Cackette analysis, containing off-road emissions from a number of categories that occur well away from population centers. Diesel-fueled TRUs and their diesel emissions are more concentrated in urban areas, thus a greater reduction of the emissions as a result of the regulation are expected to occur in urban areas, as compared to rural areas. Emission reductions are, therefore, likely to have greater benefits than those estimated by Lloyd and Cackette. Thus, the proposed rule is likely more cost-effective than the above estimate would suggest.

Reduced Ambient Ozone Levels

Emissions of NOx and ROG are precursors to the formation of ozone in the lower atmosphere. Exhaust from diesel engines contributes a substantial fraction of ozone precursors in any metropolitan area. Therefore, reductions in NOx and ROG from diesel engines would make a considerable contribution to reducing exposures to ambient ozone. Controlling emissions of ozone precursors would reduce the prevalence of the types of respiratory problems associated with ozone exposure and would reduce hospital admissions and emergency visits for respiratory problems.

F. Reasonably Foreseeable Environmental Impacts as a Result of Potential Compliance Methods

We have identified potential adverse environmental impacts from the use of diesel oxidation catalysts (DOCs) and diesel particulate filters (DPF) that may be used to comply with the proposed ATCM. These include a potential increase in sulfate PM, a potential increase in NO_2 from some DPFs, and the potential for creating hazardous wastes. As described below, options are available to mitigate these potential adverse impacts.

Diesel Oxidation Catalyst

Two potential adverse environmental impacts of the use of DOCs have been identified. First, as is the case with most processes that incorporating catalytic oxidation, the formation of sulfates increases at higher temperatures. Depending on the exhaust temperature and sulfur content of the fuel, the increase in sulfate particles may offset the reductions in soluble organic fraction emissions. Using low sulfur diesel fuel can minimize this effect. Second, a DOC could be considered a "hazardous waste" at the end of its useful life depending on the materials used in the catalytic coating. Because catalytic converters have been used on gasoline powered on-road vehicles for many years, there is a very well established market for these items (see, for example, http://www.pacific.recycle.net – an Internet posting of buyers and sellers of various scrap materials). In the recycling process, the converters are broken down, and the metal is added to the scrap-metal stream for recycling, while the catalysts (one or a combination of the platinum group metals) are extracted and reused.

Because of platinum's high activity as an oxidation catalyst, it is the predominant platinum group metal used in the production of DOCs. There is a very active market for reclaimed platinum for use in new catalytic converters, jewelry, fuel cells, cathode ray tube screens, catalysts used during petroleum refining operations, dental alloys, oxygen sensors, platinum electrode spark plugs, medical equipment, and platinum-based drugs for cancer treatment, to name a few (Kendall, 2002; Kendall, 2003).

Catalyzed Diesel Particulate Filters

These devices are composed of a ceramic DPF along with a platinum catalyst to accelerate the oxidation of carbon-containing emissions and significantly reduce diesel PM emissions. This is an obvious positive environmental impact. However, there are also inorganic solid particles present in diesel exhaust, which are captured by DPFs. These inorganic materials are metals derived from engine oil, diesel fuel, or engine wear and tear. While the PM filter is capable of capturing inorganic materials, these materials are not oxidized into a gaseous form and expelled. Because these materials would otherwise be released into the air, the filters are benefiting the environment by capturing these metallic particles, known as "ash." However, the ash that is collected in the PM filter must be removed from the filter periodically to maintain the filter effectiveness.

Ash collected from a diesel engine using a typical lubrication oil and no fuel additives has been analyzed and is primarily composed of oxides of the following elements: calcium, zinc, phosphorus, silicon, sulfur, and iron. Zinc is the element of primary concern because, if present in high enough concentrations, it can make the waste a hazardous waste. Title 22, California Code of Regulations (CCR), section 66261.24 establishes two limits for zinc in a waste: 250 milligrams per liter for the Soluble Threshold Limit Concentration and 5,000 milligrams per kilogram for the Total Threshold Limit Concentration. The presence of zinc at or above these levels would cause ash to be characterized as a hazardous waste.

Under California law, it is the generator's responsibility to determine if waste is hazardous. Applicable hazardous waste laws are found in the H&SC, division 20; title 22, CCR, division 4.5; and title 40 of the Code of Federal Regulations. Staff recommends owners that install a DPF on an engine to contact both the manufacturer of the diesel emission control system and the California Department of Toxic Substances Control (DTSC) for advice on proper waste management.

ARB staff consulted with personnel of the DTSC regarding management of the ash from DPFs. DTSC personnel advised ARB that it has a list of facilities that accept waste from businesses that qualify as a conditionally exempt small quantity generator. Such a business can dispose of a specific quantify of hazardous waste at certain Household Hazardous Waste events, usually for a small fee. Specific information regarding the identification of and acceptable disposal methods for wastes is available from the California DTSC.[10]

High-pressure water and detergent is sometimes used to remove ash from DPFs. However, this practice would generate wastewater containing metal oxides, and possibly considered hazardous waste, that can not be discharged to the sanitary

[10] Information can be obtained from local duty officers and from the DTSC web site at http://www.dtsc.ca.gov.

sewer or storm drains. Technology is currently available for reclamation of zinc from waste. For example, the Swedish company MEAB has developed processes for extracting zinc and cadmium from various effluents and industrial waste streams. Whether reclamation for reuse will be economically beneficial remains to be seen. (MEAB, 2003). Some DPF cleaning techniques can cause ash to be illegally released directly into the air/or work environment potentially exposing the public and/or workers to zinc and other metal oxides.

Because of the time and costs associated with filter maintenance, there are also efforts by industry to reduce the amount of ash formed. Most of the ash is formed from the inorganic materials in engine oil, particularly from zinc-containing additives necessary to control acidification of engine oil – due in part to sulfuric acid derived from sulfur in diesel fuel. As the sulfur content of diesel fuel is decreased, the need for acid neutralizing additives in engine oil should also decrease. A number of technical programs are ongoing to determine the impact of changes in oil ash content and other characteristics of engine oil on exhaust emission control technologies and engine wear and performance.

It may also be possible to reduce the ash level in diesel exhaust by reducing oil consumption from diesel engines. Diesel engine manufacturers over the years have reduced engine oil consumption in order to reduce PM emissions and to reduce operating costs for engine owners. Further improvements in oil consumption may be possible in order to reduce ash accumulation rates in DPFs.

In addition, measurements of NOx emissions for heavy-duty diesel vehicles equipped with passive catalyzed DPFs have shown an increase in the NO_2 portion of total NOx emissions, although the total NOx emissions remain approximately the same. In some applications, passive catalyzed DPFs can promote the conversion of nitrogen oxide (NO) emissions to NO_2 during filter regeneration. More NO_2 is created than is actually being used in the regeneration process; and the excess is emitted. The NO_2 to NOx ratios could range from 20 to 70 percent, depending on factors such as the DPF systems, the sulfur level in the diesel fuel, and the duty cycle (DaMassa, 2002).

Formation of NO_2 is a concern because it irritates the lungs and lowers resistance to respiratory infections. Individuals with respiratory problems, such as asthma, are more susceptible to the effects. In young children, NO_2 may also impair lung development. In addition, a higher NO_2/NOx ratio in the exhaust could potentially result in higher initial NO_2 concentrations in the atmosphere which, in turn, could result in higher ozone concentrations.

Model simulations have shown that a NO_2 to NO_X emission ratio of approximately 20 percent would nearly eliminate any impact of increased NO_2 emissions (DaMassa, 2002). According to the model, at the NO_2 to NOx ratio of 20 percent, there will be a decrease of the 24-hour ozone exposure (greater than 90 parts

per billion) by two percent while an increase of the peak 1-hour NO_2 by six percent (which is still within the NO_2 standard).

The health benefits derived from the use of PM filters are immediate and offset the possible adverse effects of increases in NO_2 emissions. For this reason, a cap of 20 percent NO_2 to NOx emission ratio was established for all diesel emission control systems through the ARB Verified Diesel Emission Control System procedure (Verification Procedure). ARB staff believes most TRU and TRU generator set operators will choose to install verified systems on their engines. For these engines, the 20 percent NO_2 to NOx emission ratio can be met. There is the potential, however, for the use of systems that exceed the 20 percent cap. The ARB will monitor this and determine if any additional requirements need to be incorporated into the ATCM.

Finally, DPFs can emit carbon dioxide (CO_2), a greenhouse gas, as a result of oxidizing PM. The contribution of CO_2 emissions from TRUs and TRU generator sets using DPFs, and how much these emissions contribute to global warming, is unknown.

Alternative Fuels

As discussed in sections G and H of Chapter VI, a number of alternative fuels and alternative diesel fuels show great promise in their potential to reduce diesel PM emissions. These include biodiesel, Fischer-Tropsch fuels, and alternative fuels such as natural gas. No significant negative environmental impacts have been determined from the use of alternative fuels. With respect to alternative diesel fuels, there may be a slight increase in NOx emissions as a result of biodiesel use (Hofman/Solseng, 2002).

To ensure there are no adverse impacts from the use of alternative diesel fuels, the proposed ATCM requires any alternative diesel-fuel or fuel additives used in a TRU or generator set to be verified under the ARB Verification Procedure. The Verification Procedure permits verification only if a multimedia evaluation of the use of the alternative diesel fuel or additive has been conducted. In addition, verification requires a determination by the California Environmental Policy Council that such use will not cause a significant adverse impact on public health or the environment pursuant to H&SC section 43830.8 (see Public Resource Code, section 71017).

Fuel Borne Catalysts

Other options for reducing diesel PM emissions is the use of fuel borne catalysts (FBCs). FBCs may be added to diesel fuel to decrease the ignition temperature of the carbonaceous exhaust in order to aid in soot removal from DPFs. When FBCs are used without a DPF, trace amounts would be emitted with the engine

exhaust. Currently, a FBC should be used with a filter to capture emissions. The contribution of emissions from FBCs is unknown.

G. Reasonably Foreseeable Mitigation Measures

ARB staff has concluded that no significant adverse environmental impacts should occur from adoption of and compliance with the proposed ATCM. Therefore, no mitigation measures would be necessary.

H. Reasonably Foreseeable Alternative Means of Compliance with the Proposed ATCM

Alternatives to the proposed ATCM are discussed in Chapter VII, Section C of this report. ARB staff has concluded that the proposed ATCM provides the most effective and least burdensome approach to reducing children's and the general public's exposure to diesel PM and other air pollutants emitted from diesel-fueled stationary engines.

I. Environmental Justice

The ARB is committed to integrating environmental justice in all of its activities. On December 13, 2001, the Board approved "Policies and Actions for Environmental Justice," which formally established a framework for incorporating Environmental Justice into ARB programs, consistent with the directives of State law. "Environmental Justice " or "EJ" is defined as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. These policies apply to all communities in California, but recognize that environmental justice issues have been raised more in the context of low-income and minority communities.

The EJ policies are intended to promote the fair treatment of all Californians and cover the full spectrum of ARB activities. Underlying these policies is a recognition that the ARB needs to engage community members in a meaningful way as it carries out its activities. People should have the best possible information about the air they breathe and what is being done to reduce unhealthful air pollution in their communities. The ARB recognizes its obligation to work closely with all communities, environmental and public health organizations, industry, business owners, other agencies, and all interested parties to successfully implement these policies (ARB, 2001).

Chapter III of this Staff Report generally describes the efforts made to apprise the public about the development of the proposed ATCM. Specific outreach efforts to environmental justice communities and activities have included the following:

- Since the identification of diesel PM as a toxic air contaminant (TAC) in 1998, the public has been more aware of the health risks posed by this TAC. At many of the ARB's community outreach meetings over the past few years, the public has raised questions regarding efforts to reduce exposure to diesel PM. At these meetings in April 2003, ARB staff told the public about the Diesel Risk Reduction Plan, adopted in 2000, and described some of the measures in that plan, including the proposed ATCM. These meetings were held in association with Children's Environmental Health Protection Program air monitoring studies in Barrio Logan (San Diego), Boyle Heights (Los Angeles), Wilmington (Los Angeles), and other low-income and minority communities.

- The ARB's Environmental Justice Policies and Action web page (http://www.arb.ca.gov/ch/programs/ej/ej.htm) has provided a direct link to the proposed ATCM web page via "Improving Air Quality: Diesel Risk Reduction Plan or California Air Toxics Program." The proposed ATCM web page provides accessibility to: draft versions of the ATCM; the Staff Report (including the proposed ATCM); a fact sheet in both English and Spanish; meeting and contact information; and list serve subscription.

- Environmental justice, children's health, community, and environmental activists have been notified by electronic and/or regular mail about the public workshops, the public hearing, and the availability of this Staff Report. Moreover, the ARB provides web cast access for the proposed ATCM public workshops and hearing to allow virtually everyone in the State to participate.

The proposed ATCM is consistent with the ARB EJ policy to reduce health risk from TACs in all communities, including low-income and minority communities. The proposed ATCM would reduce diesel PM emissions and health risk from thousands of TRUs and TRU generator sets operating throughout California. In addition, staff anticipates significant diesel PM emission and health risk reductions to occur in neighborhoods surrounding heavily-traveled freeways, storage and distribution facilities, rail yards, and ports where TRU and TRU generator set activity is concentrated. These neighborhoods are frequently co-located with low-income and minority communities.

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APPENDICES

APPENDIX A

PROPOSED REGULATION ORDER: TITLE 13 AIRBORNE TOXIC CONTROL MEASURES FOR IN-USE DIESEL-FUELED TRANSPORT REFRIGERATION UNITS (TRU) AND TRU GENERATOR SETS, AND FACILITIES WHERE TRUs OPERATE

** PROPOSED REGULATION ORDER **

Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRU) and TRU Generator Sets, and Facilities Where TRUs Operate

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Adopt new Section 2022, Title 13, Article 4, within Chapter 3, Division 3, California Code of Regulations, to read as follows: (Note: the entire text of section 2022 set forth below is new language proposed to be added to the California Code of Regulations.)

(a) **Purpose**. Diesel particulate matter (PM) was identified in 1998 as a toxic air contaminant. This regulation implements provisions of the Diesel Risk Reduction Plan, adopted by the Air Resources Board in October, 2000, as mandated by the Health and Safety Code Sections 39650-39675, to reduce emissions of substances that have been determined to be toxic air contaminants. Specifically, this regulation will use a phased approach to reduce the diesel PM emissions from in-use transport refrigeration units (TRUs) and TRU generator (gen) set equipment used to power electrically driven refrigerated shipping containers and trailers that are operated in California.

(b) **Applicability**.

(1) Except as provided in subsection (c), this regulation applies to owners and operators of diesel-fueled TRUs and TRU gen sets (see definition of operator and owner in section (d)) that operate in the State of California. This specifically includes operators and owners of TRUs and TRU gen sets that are installed on trucks, trailers, shipping containers, or railcars.

(2) This regulation applies to facilities located in California with 20 or more loading dock doors serving refrigerated areas where perishable goods are loaded or unloaded for distribution on trucks, trailers, shipping containers, or rail cars that are equipped with TRUs and TRU gen sets and that are owned, leased, or contracted for by the facility, its parent company, affiliate, or subsidiary that are under facility control (see definition).

(3) To the extent not already covered under subsections (b)(1) and (b)(2), above, subsection (g) of this regulation shall apply to any person engaged in this State in the business of selling to an ultimate purchaser, or renting or leasing new or used TRUs or TRU gen sets, including, but not limited to, manufacturers, distributors, and dealers.

(4) Severability. If any subsection, paragraph, subparagraph, sentence, clause, phrase, or portion of this regulations is, for any reason, held invalid, unconstitutional, or unenforceable by any court of competent jurisdiction, such portion shall be deemed as a separate, distinct, and independent provision, and

such holding shall not affect the validity of the remaining portions of the regulation.

(c) **Exemptions**. This regulation does not apply to military tactical support equipment.

(d) **Definitions**. For purposes of this regulation, the following definitions apply:

(1) "Affiliate or Affiliation" refers to a relationship of direct or indirect control or shared interests between the subject business and another business.

(2) "Alternative Fuel" means natural gas, propane, ethanol, methanol, or advanced technologies that do not rely on diesel fuel, except as a pilot ignition source at an average ratio of less than 1 part diesel fuel to 10 parts total fuel on an energy equivalent basis. Alternative fuels also means any of these fuels used in combination with each other or in combination with other non-diesel fuels. Alternative-fueled engines shall not have the capability of idling or operating solely on diesel fuel at any time.

(3) "Alternative-Fueled Engine" means an engine that is fueled with a fuel meeting the definition of alternative fuel.

(4) "Alternative Diesel Fuel" means any fuel used in diesel engines that is not a reformulated diesel fuel as defined in Sections 2281 and 2282 of Title 13, of the California Code of Regulations, and does not require engine or fuel system modifications for the engine to operate, although minor modifications (e.g. recalibration of the engine fuel control) may enhance performance. Examples of alternative diesel fuels include, but are not limited to, biodiesel, Fischer Tropsch fuels, and emulsions of water in diesel fuel. Natural gas is not an alternative diesel fuel. An emission control strategy using a fuel additive will be treated as an alternative diesel fuel based strategy unless:

(A) The additive is supplied to the vehicle or engine fuel by an on-board dosing mechanism, or

(B) The additive is directly mixed into the base fuel inside the fuel tank of the vehicle or engine, or

(C) The additive and base fuel are not mixed until vehicle or engine fueling commences, and no more additive plus base fuel combination is mixed than required for a single fueling of a single engine or vehicle

(5) "ARB" means the California Air Resources Board.

(6) "B100 Biodiesel Fuel" means 100% biodiesel fuel derived from vegetable oil or animal fat and complying with ASTM D 6751-02 and commonly or commercially known, sold, or represented as "neat" biodiesel or B100. B100 biodiesel fuel is an alternative diesel fuel.

(7) "B100 Biodiesel-Fueled" (compression-ignition engine) means a compression-ignition engine that is fueled by B100 biodiesel fuel.

(8) "Business" means an entity organized for profit including, but not limited to, an individual, sole proprietorship, partnership, limited liability partnership, corporation, limited liability company, joint venture, association or cooperative; or solely for purposes of the Prompt Payment Act (Government Code 927 et seq.), a duly authorized nonprofit corporation.

(9) "California-Based TRUs and TRU Gen Sets" means TRUs and TRU gen sets that owner/operators have been regularly assigned to terminals within California.

(10)"CARB Diesel Fuel" means any diesel fuel that meets the specifications defined in *13 CCR 2281* and *13 CCR 2282*.

(11)"Carbon Monoxide (CO)" means a colorless, odorless gas resulting from the incomplete combustion of hydrocarbon fuels.

(12)"Carrier" means any person, party, or entity who undertakes the transport of goods from one point to another.

(13)"Compression Ignition (CI) Engine" means an internal combustion engine with operating characteristics significantly similar to the theoretical diesel combustion cycle. The regulation of power by controlling fuel supply in lieu of a throttle is indicative of a compression ignition engine.

(14)"Consignee" (see receiver).

(15)"Consignor" (see shipper).

(16)"Cryogenic Temperature Control System" means a heating and cooling system that uses a cryogen, such as liquid carbon dioxide or liquid nitrogen that is routed through an evaporator coil that cools air blown over the coil. The cryogenic system uses a vapor motor to drive a fan and alternator, and a propane-fired heater superheats the carbon dioxide for heating and defrosting.

(17)"Diesel Fuel" means any fuel that is commonly or commercially known, sold, or represented as diesel fuel No. 1-D or 2-D, pursuant to the specifications in *ASTM Standard Specification for Diesel Fuel Oils D975-98*.

(18)"Diesel-Fueled" means fueled by diesel fuel or CARB diesel fuel in whole or in part, except as allowed for a pilot ignition source under the definition for "alternative fuel".

(19)"Diesel Oxidation Catalyst (DOC)" means the use of a catalyst to promote the oxidation processes in diesel exhaust. Usually refers to an emission control

device that includes a flow-through substrate where the surfaces that contact the exhaust flow have been catalyzed to reduce emissions of the organic fraction of diesel particulates, gas-phase hydrocarbons, and carbon monoxide.

(20)"Diesel Particulate Filter (DPF)" means an emission control technology that reduces PM emissions by trapping the particles in a flow filter substrate. Periodically the collected particles are either physically removed or oxidized (burned off) in a process called regeneration.

(21) "Diesel Particulate Matter" means the particles found in the exhaust of diesel-fueled CI engines. Diesel PM may agglomerate and adsorb other species to form structures of complex physical and chemical properties.

(22) "Dual-Fuel Engine" means an engine designed to operate on a combination of alternative fuel, such as compressed natural gas (CNG) or liquefied petroleum gas (LPG), and conventional fuel, such as diesel or gasoline. These engines have two separate fuel systems, which either inject both fuels simultaneously into the engine combustion chamber or fumigate the gaseous fuel with the intake air and inject the liquid fuel into the combustion chamber.

(23)"Emergency" means any of the following times:
(A) A failure or loss of normal power service that is not part of an "interruptible service contract" (see definition in subsection (d));
(B) A failure of a facility's internal power distribution system, provided the failure is beyond the reasonable control of the operator;
(C) When an affected facility is placed under an involuntary "rotating outage" (see definition in subsection (d)).

(24)"Emission Control Strategy" means any device, system, or strategy employed with a diesel-fueled CI engine that is intended to reduce emissions. Examples of emission control strategies include, but are not limited to, particulate filters, diesel oxidation catalysts, selective catalytic reduction systems, alternative fuels, fuel additives used in combination with particulate filters, alternative diesel fuels, and combinations of the above.

(25)"Emissions Rate" means the weight of a pollutant emitted per unit of time (e.g., grams per second).

(26)"Executive Officer" means the Executive Officer of the California Air Resources Board or his or her delegate.

(27)"Facility" means any facility where TRU-equipped trucks, trailers, containers or railcars are loaded or unloaded with perishable goods. This includes, but is not limited to, grocery distribution centers, food service distribution centers, cold storage warehouses, and intermodal facilities. Each business entity at a commercial development is a separate facility for the purposes of this regulation,

provided the businesses are "independently owned and operated" (see definition in subsection (d)).

(28)"Facility Control (of TRUs or TRU Gen Sets)" means the TRUs or TRU gen sets located at the facility are owned or leased by the facility, its parent company, affiliate, or a subsidiary, or under contract for the purpose of providing carrier service to the facility, and the TRUs' or TRU gen sets' arrival, departure, loading, unloading, shipping and/or receiving of cargo is determined by the facility, parent company, affiliate, or subsidiary (e.g scheduled receiving, dispatched shipments).

(29)"Fischer-Tropsch Diesel Fuel" See "ultra-low-aromatic synthetic diesel fuel".

(30)"Fuel Additive" means any substance designed to be added to fuel or fuel systems or other engine-related engine systems such that it is present in-cylinder during combustion and has any of the following effects: decreased emissions, improved fuel economy, increased performance of the engine; or assists diesel emission control strategies in decreasing emissions, or improving fuel economy or increasing performance of the engine.

(31)"Generator Set (gen set)" means a CI engine coupled to a generator used as a source of electricity.

(32)"Hybrid Cryogenic Temperature Control System" means a temperature control system that uses a cryogenic temperature control system in conjunction with a diesel engine.

(33)"Independently Owned and Operated" means a business concern that independently manages and controls the day-to-day operations of its own business through its ownership and management, without undue influence by an outside entity or person that may have an ownership and/or financial interest in the management responsibilities of the applicant business or small business.

(34)"Intermodal Facility" means a facility involved in the movement of goods in one and the same loading unit or vehicle which uses successively several modes of transport without handling of the goods themselves in changing modes. Such a facility is typically involved in loading and unloading shipping containers and trailer vans to and from railcars, trucks, and ocean-going ships.

(35)"Interruptible Service Contract" means any arrangement in which a nonresidential electrical customer agrees to reduce or consider reducing its electrical consumption during periods of peak demand or at the request of the System Operator in exchange for compensation, or assurances not to be blacked out or other similar non-monetary assurances.

(36)"In Use TRU, TRU gen set, or engine" means a TRU, TRU gen set, or engine that is not a "new" TRU, TRU gen set, or engine.

(37)"Low Emission TRU (LETRU or L)" means a TRU or TRU gen set that meets the performance standards described under paragraph (e)(1)(A)(i) or (ii).

(38)"Manufacturer" means a business as defined in Government Code § 14837(c).

(39)"Military tactical support equipment (TSE)" means equipment that meets military specifications, owned by the U.S. Department of Defense and/or the U.S. military services, and used in combat, combat support, combat service support, tactical or relief operations, or training for such operations.

(40)"Model Year (MY)" means diesel-fueled engine manufacturer's annual production period, which includes January 1st of a calendar year, or if the manufacturer has no annual production period, the calendar year.

(41)"New TRU, TRU Gen Set, or Engine" means any TRU, TRU gen set, or engine that has never been subject to a retail sale or lease to an "ultimate purchaser" (see definition in subsection (d)).

(42)"Nitrogen Oxide (NOx)" means compounds of nitric oxide (NO), nitrogen dioxide (NO_2), and other oxides of nitrogen. Nitrogen oxides are typically created during combustion processes and are major contributors to smog formation and acid deposition.

(43)"Non-methane Hydrocarbons (NMHC)" means the sum of all hydrocarbon air pollutants except methane. NMHCs are precursors to ozone formation.

(44)"Operate" means to start, cause to function, program the temperature controller, select an operating program or otherwise control, fuel, monitor to assure proper operation, or keep in operation.

(45)"Operator" means any person, party or entity that operates a TRU or TRU gen set for the purposes of transporting perishable goods, excluding an employee driver and third party maintenance and repair service, and including but not limited to:

(A) Manufacturer, producer, supplier, carrier, shipper, consignor, consignee, receiver, distribution center, or warehouse of perishable goods;

(B) An individual, trust, firm, joint stock company, business concern, partnership, limited liability company, association, or corporation including but not limited to, a government corporation;

(C) Any city, county, district, commission, the state or any department, agency, or political subdivision thereof, any interstate body, and the federal government or any department or agency thereof to the extent permitted by law; or

(46)"Owner" means any person that legally holds the title (or its equivalent) showing ownership of a TRU or TRU gen set, excluding a bank or other financial lending institution, and including but not limited to:

(A) Manufacturer, producer, supplier, carrier, shipper, consignor, consignee, receiver, distribution center, warehouse;

(B) An individual, trust, firm, joint stock company, business concern, partnership, limited liability company, association, or corporation including but not limited to, a government corporation;

(C) Any city, county, district, commission, the state or any department, agency, or political subdivision thereof, any interstate body, and the federal government or any department or agency thereof to the extent permitted by law; or

(47)"Owner/Operator" means a requirement applies to the owner and/or operator of a TRU or TRU gen set, as determined by agreement or contract between the parties if the two are separate business entities.

(48)"Parent Company" means a company that has a controlling interest in another company, usually through ownership of more than one-half the voting stock.

(49)"Particulate Matter (PM)" means the particles found in the exhaust of CI engines, which may agglomerate and adsorb other species to form structures of complex physical and chemical properties.

(50)"Rated Brake Horsepower" means the power delivered, according to the statement of the engine manufacturer, at the rated speed.

(51)"Real Emission Reductions" means that an action is taken that results in reductions in the PM emission rate of an in-use engine (e.g. a VDECS is installed that reduced the PM emissions rate by more than 50%).

(52)"Receiver" means the person, party, or entity that receives shipped goods, cargo, or commodities.

(53)"Refrigerated Shipping Container TRU" means a shipping container equipped with a TRU.

(54)"Rotating Outage" means a controlled involuntary curtailment of electrical power service to consumers as ordered by the system operator - see definition in subsection (d).

(55)"Shipper" means the person, party, or entity who usually owns or supplies the commodities shipped by a carrier.

(56)"System Operator" means one of the several organizations that control energy in California. System operators include, but are not limited to, the California Independent System Operator, the Los Angeles Department of Water and Power, the Imperial Irrigation District, the Sacramento Municipal Utility District.

(57)"Terminal" means any place where a TRU-equipped truck, trailer, container, railcar or TRU gen set is regularly garaged, maintained, operated, or dispatched from, including a dispatch office, cross-dock facility, maintenance shop, business, or private residence.

(58)"Transport Refrigeration Unit (TRU)" means refrigeration systems powered by integral internal combustion engines designed to control the environment of temperature sensitive products that are transported in semi-trailer vans, truck vans, reefer railcars, or shipping containers. TRUs may be capable of both cooling and heating.

(59)"TRU Generator Set (TRU gen set)" means a generator set that is designed and used to provide electric power to electrically driven refrigeration units of any kind. This includes, but is not limited to gen sets that provide electricity to electrically powered refrigeration systems for semi-trailer vans and shipping containers.

(60)"Ultimate Purchaser" means with respect to a new TRU, TRU gen set, or engine, the first person who in good faith purchases a new TRU, TRU gen set, or engine for purposes other than resale.

(61)"Ultra-Low-Aromatic Synthetic Diesel Fuel" means fuel produced from natural gas, coal, or biomass by the Fischer-Tropsch gas-to-liquid chemical conversion process, or similar process that meets the following properties:

Table 1

Property	ASTM	Value
Sulfur Content (ppmw)	D5453-93	<1
Total Aromatic Content (wt %)	D5186-96	<1.5%
Polynuclear Aromatic Content (wt %)	D5186-96	<0.5%
Natural Cetane Number	D613-84	>74

(62)"Ultra-Low Emission TRU (ULETRU or U)" means a TRU or TRU gen set that meets the performance standards described under subparagraph (e)(1)(A)(i)

and (ii) or that uses an "alternative technology" in accordance with subparagraph (e)(1)(A)(iii).

(63) "Verification Classification Level" means the classification assigned to a Diesel Emission Control Strategy by the Executive Officer as defined in the *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emission from Diesel Engines (13 CCR Sections 2700 – 2710).* PM reductions correspond as follows: Level 1: ≥25%; Level 2: ≥50%; Level 3: ≥85% or 0.01 g/hp-hr.

(64) "Verified Diesel Emission Control Strategy" (VDECS) means an emission control strategy designed primarily for the reduction of diesel particulate matter emissions that has been verified per the *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines (13 CCR Sections 2700 – 2710).* Examples of diesel retrofit systems that may be verified include, but are not limited to, diesel particulate filters, diesel oxidation catalysts, fuel additives (e.g. fuel-borne catalysts), alternative fuels (e.g. dual fuel), alternative diesel fuels, and combinations of the above.

(e) **Requirements**.

(1) **In-use Operation**:

(A) **In-Use Performance Standards:** In accordance with the schedule set forth below in paragraph (e)(1)(B), no owner/operator shall operate a TRU or TRU gen set in California unless it meets the in-use emission category performance standards set forth below.

(i) In-Use performance standard categories for TRU and TRU gen set engines with rated brake horsepower less than 25 horsepower (<25 hp) are shown in Table 2, along with the engine certification standards or the level of Verified Diesel Emission Control Strategy (VDECS) (see definition) that is necessary to qualify for each category.

Table 2
<25 HP TRU and TRU Gen Set In-Use PM Performance Standards

In-Use Emission Category	Engine Certification (g/hp-hr)	Level of VDECS Equipped with
Low Emission TRU (LETRU or L)	0.30	Level 2
Ultra-Low Emission TRU (ULETRU or U)	NA[1]	Level 3

a. Compliance can be achieved by:

1. Replacing the engine with a certified engine meeting the applicable Tier 4 "Interim" nonroad/offroad emissions standards for all regulated pollutants and the in-use PM performance standard. Only engines for which certification data has been provided to ARB Stationary Source Division shall be considered in compliance. The Executive Officer will consider such submittals, publish, and make available a list of qualifying engines.
2. Equipping the engine with the required Level of VDECS.

(ii) In-Use performance standard categories for TRU and TRU gen sets engines with rated brake horsepower greater than or equal to 25 horsepower (≥ 25 hp) are shown in Table 3, along with the engine certification standards or the level of VDECS that is necessary to qualify for each category.

Table 3
≥ 25 HP TRU and TRU Gen Set In-Use PM Performance Standards

In-Use Emission Category	Engine Certification (g/hp-hr)	Level of VDECS Equipped with
Low Emission TRU (LETRU or L)	0.22	Level 2
Ultra-Low Emission TRU (ULETRU or U)	0.02	Level 3

a. Compliance can be achieved by:

1. Replacing the engine with a certified engine meeting the applicable Tier 4 "Interim" nonroad/offroad emissions standards for all regulated pollutants and the in-use PM performance standard. Only engines for which certification data has been provided to ARB

[1] Not Applicable - ARB and U.S. EPA will perform a technical review in 2007 to evaluate DOC or filter-based standard for <25 hp category new engines in 2013. If a more stringent "long term" level for new tier 4 (as identified in the May 23, 2003 Notice of Proposed Rulemaking to Control Emissions of Air Pollution from Nonroad Diesel Engines and Fuel) engines is adopted by U.S. EPA for this horsepower category, the Board will consider adopting an engine certification in-use performance standard for ULETRU for <25 hp TRUs and TRU gen sets.

Stationary Source Division shall be considered in compliance. The Executive Officer will consider such submittals, publish, and make available a list of qualifying engines.

2. Equipping the engine with the required Level of VDECS.

(iii) As an alternative to meeting the ULETRU in-use performance standards in subsection (e)(1)(A)(i) and (ii), an owner/operator may operate a TRU or TRU gen set in California meeting one of the *Alternative Technology* options listed below. Alternative Technologies qualify to meet the ULETRU in-use performance standard only if the TRU or TRU gen set is operated under the conditions included in the description listed below.

a. Electric standby, provided that the TRU is not operated under diesel engine power while at a facility, except during an emergency.

b. Cryogenic temperature control systems or hybrid cryogenic temperature control systems, provided that the TRU does not operate under diesel engine power while at a facility, except during an emergency.

c. Alternative-fueled engines (see definition in subsection (d)). If the engine is a CI engine, a VDECS is required.

Note: If the engine is not a compression ignition diesel fueled engine, this regulation would not apply, but the engine may have to meet other emission standards (e.g. large spark-ignited engine standards if >25 hp).

d. Fuel exclusively with an alternative-diesel-fuel (see definition in subsection (d)) that has been verified as a VDECS, provided it is used in accordance with the requirements of subsection (e)(2)(A) and the alternative-diesel-fuel contains no convention diesel fuel.

e. Power by fuel cells. If a reformer is used, then emissions must be evaluated and verified through the *Verification Procedure Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines.*

f. Equip with any other system approved by the Executive Officer to not emit diesel PM or increase public health risk while at a facility.

(B) **In-Use Compliance Dates**.

(i) No owner/operator shall operate a 2001 and older model year (MY) TRU or TRU gen set engine in California unless it meets the in-use performance criteria set forth in paragraph (e)(1)(A) for

a. LETRU on or before December 31, 2008, and

b. ULETRU on or before December 31, 2015, as shown in Tables 4 and 5.

(ii) No owner/operator shall operate a 2002 MY TRU or TRU gen set engine in California unless it meets the in-use performance criteria set forth in paragraph (e)(1)(A) for

a. LETRU on or before December 31, 2009, and

b. ULETRU on or before December 31, 2016, as shown in Tables 4 and 5.

(iii) No owner/operator shall operate a 2003 MY and subsequent MY TRU or TRU gen set engine in California unless it meets the in-use performance criteria set forth in paragraph (e)(1)(A) for ULETRU on or before December 31st of the seventh year past the unit's model year, as shown in Tables 4 and 5.

Table 4: <25 HP TRU and TRU Gen Set Engines
In-Use Compliance Dates

	In-Use Compliance Year[2]													
MY	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20
'01 & Older									U	U	U	U	U	U
'02										U	U	U	U	U
'03[3]				U	U	U	U	U	U	U	U	U	U	U
'04					U	U	U	U	U	U	U	U	U	U
'05						U	U	U	U	U	U	U	U	U
'06							U	U	U	U	U	U	U	U
'07								U	U	U	U	U	U	U
'08									U	U	U	U	U	U
'09										U	U	U	U	U
'10											U	U	U	U
'11												U	U	U
'12													U	U
'13														U

[2] Compliance date is December 31st of the compliance year shown. "MY" means model year. Black shaded areas are years with no requirements since in-use compliance year precedes model year . Dark shaded areas without letter codes have no requirements, pending in-use compliance date. "L" means must meet LETRU in-use performance standards. "U" means must meet ULETRU in-use performance standards.

[3] TRUs and TRU gen sets with MY 2003 engines and subsequent MY engines shall be required to comply with ULETRU requirements by the end of the seventh year after the model year. The exception to this is ≥25 hp 2013 and subsequent model years, since these model years would meet ULETRU in-use performance standards as new engines.

Table 5: ≥ 25 HP TRU and TRU Gen Set Engines
In-Use Compliance Dates

MY	In-Use Compliance Year[4]													
	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20
'01 & Older									U	U	U	U	U	U
'02										U	U	U	U	U
'03[5]				U	U	U	U	U	U	U	U	U	U	U
'04					U	U	U	U	U	U	U	U	U	U
'05						U	U	U	U	U	U	U	U	U
'06							U	U	U	U	U	U	U	U
'07								U	U	U	U	U	U	U
'08									U	U	U	U	U	U
'09										U	U	U	U	U
'10											U	U	U	U
'11												U	U	U
'12													U	U
'13														

(C) **Replacements Due to Failures**.

(i) If a VDECS fails within its warranty period, the owner/operator of the TRU or TRU gen set must replace it with the same VDECS or a higher verification classification level, if available.

(ii) If a VDECS fails outside its warranty period and a higher verification classification level VDECS is available, then the owner/operator of the TRU or TRU gen set shall upgrade to the highest level VDECS required under paragraph (e)(1)(A)(i) and (ii) that is determined to be cost-effective by the Executive Officer.

(D) **In-Use recordkeeping and reporting.** In-use recordkeeping and reporting shall be completed by the operator in accordance with the requirements of subsection (f)(1).

(E) **ARB Identification Numbering Requirements**. Identification numbers will be issued to help expedite the inspection procedure and prevent shipping delays.

(i) California-based TRUs and TRU gen sets:

[4] Compliance date is December 31st of the compliance year shown. "MY" means model year. Black shaded areas are years with no requirements since in-use compliance year precedes model year . Dark shaded areas without letter codes have no requirements, pending in-use compliance date. "L" means must meet LETRU in-use performance standards. "U" means must meet ULETRU in-use performance standards.

[5] TRUs and TRU gen sets with MY 2003 engines and subsequent MY engines shall be required to comply with ULETRU requirements by the end of the seventh year after the model year. The exception to this is ≥25 hp 2013 and subsequent model years, since these model years would meet ULETRU in-use performance standards as new engines.

a. On or before January 31, 2009, owner/operators of all California-based TRUs and TRU gen sets subject to this regulation shall apply for an ARB identification number for all California-based TRUs or TRU gen sets operated by the operator by submitting an application that includes the information listed below.

1. Operator name, address, and contact information for the responsible official (e.g. phone number, email address, fax number)

2. Owner name, address, and contact information (if other than operator)

3. TRU or TRU gen set make, model, model year, and serial number

4. TRU engine make, model, model year, and serial number

5. Terminal or terminals that the TRU is assigned to with address and contact information

6. Other associated identification numbers, which may include (as applicable):

   A. Vehicle Identification Number (truck's or trailer's VIN)

   B. Vehicle license number (e.g. truck's or trailer's)

   C. Railcar recording mark and car number

   D. Container number

   E. Company equipment number (if any)

7. Compliance status with paragraph (e)(1)(A) requirements. If compliance not as-yet required, mark N/A.

   A. Date when compliance was achieved

   B. What performance standard was met (e.g. LETRU or ULETRU)

   C. How compliance was achieved (e.g. new compliant TRU, TRU engine replacement, or description of VDECS that was used)

   D. Identify who did the installation work (if applicable)

b. Applications shall be submitted by one of the following methods:

1. Mail or deliver a physical report to ARB at the address listed immediately below:

   California Air Resources Board
   Stationary Source Division
   P.O. Box 2815
   Sacramento, CA 95812

2. Electronically submit through ARB's web site. The web address will be identified in an advisory.

c. TRUs and TRU gen sets added to an operator's TRU operations after January 31, 2009 shall be brought into compliance with subsection (e)(1)(E). An application shall be submitted to ARB within 30 days of the unit entering the operator's control:

1. Requesting an ARB I.D. number for a new TRU or TRU gen set that was not previously numbered, or

2. Requesting a change in owner or operator (or other pertinent application information) for used equipment that already has an ARB I.D. number.

d. Failure to apply or submittal of false information is a violation of state law subject to civil penalty.

e. On or before February 1, 2009, the Executive Officer shall begin issuing identification numbers to TRU and TRU gen set operators for each unit based in California for which a complete application has been filed. The number will include a 2-digit prefix for model year (e.g. 2001 model year would have a prefix 01); a 6-digit serial number; a check-digit, and a letter indicating compliance status with in-use performance standards (either "L" or "U"). In the event that an operator applies for an early compliance certificate in accordance with subsection (e)(1)(F), ARB will also issue a certificate which acknowledges early compliance per (e)(1)(F)(iii).

f. Within 30 days of receipt of the ARB-issued identification number, owner/operators shall permanently affix or paint the identification number on the TRU or TRU gen set chassis housing in clear view according to the following specification:

1. The ARB identification number shall be preceded by the letters "**ARB**"

2. Letters and numbers shall contrast sharply in color with the color of the background surface on which the letters are placed.

3. The location of the I.D. number shall be as follows:

   A. Truck and trailer TRUs - both sides of TRU chassis housing

   B. Rail car and container TRUs– both sides of the TRU

   C. TRU gen sets – both sides of gen set housing

4. Letters and numbers shall be readily legible during daylight hours, from a distance of 50 feet (15.24 meters) while unit is stationary.

5. Marking shall be kept maintained in a manner that retains the legibility required by the subparagraph immediately above.

(ii) Non-California-based TRUs and TRU Gen Sets:

a. Operators of non-California-based TRUs and TRU gen sets may voluntarily apply for ARB identification numbers for TRUs that are based outside of California but operate within California during the normal course of business. Non-California-based operators may voluntarily submit the same application information listed above in subparagraph (e)(1)(E)(i)a., above, using the same methods of submittal listed in subparagraph (e)(1)(e)(i)b., above. Upon application approval, ARB would issue identification numbers to the operator in accordance with subparagraph (e)(1)(E)(i)e., above. The non-California-based operator would then permanently affix or paint the identification number on the TRU or TRU gen set chassis in clear view, in accordance with (e)(1)(E)(i)f., above.

(F) **Early Compliance with LETRU In-Use Performance Standards.**

(i) For 2002 and older MY TRU and TRU gen set engines, operators or owners that meet the LETRU in-use performance standard earlier than required in paragraph (e)(1)(B) may apply to the Executive Officer for a delay in the ULETRU in-use performance standard. Except as provided below, early compliance would be achieved through any of the options available in paragraph (e)(1)(A).

a. This delay would not be available to the operator or owner if the engine manufacturer of the replacement engine is using the early

compliance with engine emissions standards in U.S. EPA's Averaging, Banking, and Trading Program (or California's equivalent program)

b. Early compliance is conditioned upon real emission reductions (refer to definition in sub section (d)) occurring earlier than the applicable compliance deadline.

(ii) Early LETRU compliance with real emission reductions would allow specific units to delay compliance with ULETRU in-use performance standards by up to three years, according to the rounding conventions and examples listed below.

a. Each year of early compliance with the LETRU in-use performance standards would be rewarded with 1 year delay in the ULETRU in-use performance standard.

1. One full year early compliance qualifies for one full year delay in meeting ULETRU compliance.

2. Two full years early compliance qualifies for two full years delay in meeting ULETRU compliance.

3. Three full years early compliance qualifies for three full years delay in meeting ULETRU compliance.

b. A partial year of early LETRU compliance would be rounded to the nearest full year for the delayed ULETRU requirements.

1. Early LETRU compliance of 183 days or more in a calendar year would count toward a one year ULETRU delay

2. Early LETRU compliance of 182 days or less in a calendar year would not count toward a ULETRU delay.

(iii) Upon receipt of an application to delay ULETRU compliance, the Executive Officer shall determine if the application demonstrates early compliance with LETRU in-use performance standards in accordance with subsection (e)(1)(F)(i), and if the application is approved, shall delay the in-use ULETRU compliance date for specific TRUs and TRU gen sets operating in California in accordance with subparagraph (e)(1)(F)(ii).

(iv) Upon approval of the application, ARB shall issue a certificate and ARB identification number in accordance with subsection (e)(1)(E)(i)e. which acknowledges early compliance with LETRU requirements and discloses the number of years delay granted, and resulting ULETRU compliance date.

(v) The operator shall maintain a legible copy of the certificate in a water-tight sleeve mounted inside the TRU or TRU gen set chassis housing. The operator shall paint the identification number in clear view in accordance with subsection (e)(1)(E)(i)f. on the specific TRU or TRU gen set that was granted the compliance extension.

(2) **Fuel Requirements**:

(A) **Operators Choosing to Use Alternative-Diesel-Fuels**. Operators choosing to use alternative-diesel-fuels in compression ignition TRU and TRU gen set engines to meet the requirements of subsection (e)(1) shall:

(i) Maintain records in accordance with subsection (f)(1)(B) of this regulation.

(ii) Use only fuel that is a VDECS alternative diesel fuel that contains no conventional diesel fuel in TRUs or TRU gen sets operated in California.

(iii) Permanently affix a label in clear view near the fill spout that identifies the proper fuel that is required to be in compliance.

(iv) In the event that the operator decides to revert to using CARB diesel fuel, the operator shall comply with the requirements of subsection (e)(1) within 10 days of discontinuation of alternative diesel fuel use. Within 10 days of discontinuation, the operator shall notify the Executive Officer in writing of this change in fuel use and shall include an update to any ARB I.D. number application or annual report submitted to comply with subsections (e)(1)(E), (e)(1)(F), or (f)(1).

(B) **Operators that Retrofit TRUs or TRU Gen Sets with a VDECS**. Operators that retrofit TRUs or TRU gen sets with a VDECS that requires certain fuel properties to be met in order to achieve the required PM reduction or PM emissions shall only fuel the subject TRU or TRU gen set with fuel that meets these specifications when operating in the state of California. In addition, operators that choose a VDECS that requires certain fuel properties to be met in order to prevent damage to the VDEC or an increase in toxic air contaminants, other harmful compounds, or in the nature of the emitted PM shall only fuel the subject TRU or TRU gen set with fuel that meets these specifications.

(f) Monitoring, Recordkeeping, and Reporting Requirements

(1) **TRU and TRU gen set operator recordkeeping and reporting**.

(A) **Operator Reporting**.

(i) All operators subject to this regulation shall submit an Operator Report to ARB by January 31, 2009 that shall include the following information:

a. Operator name, address, and contact information for the responsible official (phone number, email address, fax number).

b. List of all terminals owned or leased by the operator located within California, with address, phone number, and terminal contact name.

c. TRU and TRU gen set inventory information for each TRU and TRU gen set based in California that is owned or leased by the operator:

1. TRU or gen set make, model, model year, and serial number

2. TRU owner, and if other than operator, owner name, address, and contact.

3. Engine make, model, model year, and serial number

4. Terminal(s) that the TRU is assigned to

5. ARB TRU or TRU gen set identification number, if already issued. If the ARB identification number has not been issued or there has been a change in the other identification numbers listed below since the prior annual report, then provide the following identification numbers (as applicable):

A. Vehicle Identification Number

B. Vehicle license number

C. Railcar recording mark and car number

D. Container number

E. Company equipment number

6. Compliance status with paragraph (e)(1)(A) requirements.

(ii) The Operator Report shall be updated within 30 days when changes to any of the above operator information occur.

a. Operator Reports shall be submitted by one of the following methods:

1. Mail or deliver a physical report to ARB at the address listed immediately below:

   California Air Resources Board
   Stationary Source Division
   P.O. Box 2815
   Sacramento, CA 95812

2. Electronically submit through ARB's web site. The web address will be identified in an advisory.

(iii) Failure to report or submittal of false information is a violation of state law subject to civil penalty.

(B) **Alternative Diesel Fuel Use and Fuel Additive Recordkeeping and Reporting**.

(i) Operators that choose a compliance pathway that involves the use of alternative-diesel-fuel in accordance with subparagraph (e)(1)(A)(iii)d. (e.g. B100 biodiesel fuel or ultra-low-aromatic synthetic diesel fuel) and/or a VDECS that includes the use of a fuel additive (e.g. fuel-borne catalyst) shall maintain records that document exclusive use of the chosen fuel or additive for each affected CI engine and hours of operation. Appropriate records would be copies of receipts or invoices of appropriate fuel and/or fuel additive and daily operating hour logs.

(ii) Records shall be kept available for a minimum of three (3) years and shall be compiled and made available to the ARB upon request.

(iii) Failure to keep records or submittal of false information is a violation of state law subject to civil penalty.

(2) **Facility monitoring, recordkeeping, and reporting**.

(A) **Facility Reporting**. All facilities subject to this subsection shall submit a Facility Report to ARB by January 31, 2005, containing the following information, as of December 31, 2004:

(i) Contact information for the facility's responsible official.

(ii) Provide all North American Industrial Classification System codes (NAICS) applicable to the facility.

(iii) The number of loading dock doors serving refrigerated storage space

(iv) The number of square feet of refrigerated storage space.

(v) The number of TRUs or TRU gen sets under facility control by model year and horsepower category.

(vi) The number of refrigerated trucks, trailers, containers, or railcars leased or rented.

(vii) The total annual TRU engine operating hours for all TRUs or TRU gen sets under facility control during 2004.

(viii) The average weekly number of inbound refrigerated trucks, trailers, containers, and railcars delivering goods to the facility during 2004.

(ix) The average weekly number of outbound refrigerated trucks, trailers, containers and railcars delivering goods from the facility during 2004.

(x) The average total number of hours per week that outbound TRU or TRU gen set engines operate while at the facility during 2004.

(xi) The average total number of hours per week that inbound TRU or TRU gen set engines operate while at the facility during 2004.

(B) **Recordkeeping.** Recordkeeping that substantiates the information reported in the Facility Report shall be maintained and shall be compiled and made available to State inspectors upon request for a minimum of three (3) years.

(C) **Facility Report Submittals**. Facility Reports shall be submitted by one of the following methods:

(i) Mail or deliver a physical report to ARB at the address listed immediately below:

California Air Resources Board
Stationary Source Division
P.O. Box 2815
Sacramento, CA 95812

(ii) Electronically submit through ARB's web site. The web address will be identified in an advisory.

(D) **Failure to report or submittal of false information**. Failure to report or submittal of false information is a violation of state law subject to civil penalty.

(g) Prohibitions

(1) No person who is engaged in this State in the business of selling to an ultimate purchaser, or renting or leasing new or used TRUs or TRU gen sets, including, but not limited to, manufacturers, distributors, and dealers, shall intentionally or negligently import, deliver, purchase, receive, or otherwise acquire a new or used TRU or TRU gen set engine that does not meet the performance requirements or alternatives set forth in section (e)(1) above.

(2) No person who is engaged in this State in the business of selling to an ultimate purchaser new or used TRU or TRU gen set engines, including, but not limited to, manufacturers, distributors, and dealers, shall sell, or offer to sell, to an ultimate purchaser who is a resident of this State or a person that could reasonably be expected to do business in this State a new or used TRU or TRU gen set engine that does not meet the performance requirements or alternatives set forth in section (e)(1) above.

(3) No person who is engaged in this State in the business of renting or leasing new or used TRU or TRU gen set engines, including, but not limited to, manufacturers, distributors, and dealers, shall lease, offer to lease, rent, or offer to rent, in this state any new or used TRU or TRU gen set engine that does not meet the performance requirements or alternatives set forth in section (e)(1) above.

(4) Operators of affected facilities and operators of affected TRUs and TRU gen sets are prohibited from taking action to divert affected TRUs to alternate staging areas in order to circumvent the requirements of this section.

NOTE: Authority cited: sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 43013, 43018, California Health and Safety Code. Reference: sections 39618, 39650, 39658, 39659, 39666, 39667, 40717.9, 43013, and 43018.

APPENDIX B

TRU
DIESEL PM
CONTROL TECHNOLOGY OPTION MATRIX

TRU Diesel PM Control Tec ology Option Matrix[1] 10-1-03

Technology	PM/Nox Control Efficiency	Demonstrated in TRUs?	Cost[2]	Verified with ARB for TRU?	Pros	Cons
Biodiesel (100%)	25-50% PM; 12% NOx increase (can be reduced with additives and fuel system adjustments).[3]	No, but 200 hour tests on Yanmar 3-cylinder DI engine passed EMA tests with no problems.[4]	$1.25 to $1.50/gal plus taxes[5]; additional fueling infrastructure costs, if dual fuel needs.	No	No engine modifications necessary for post-1993; compared to diesel: higher Cetane, better lubricity, better energy balance, no sulfur, reduces greenhouse gas emissions, substantial reductions in PAH emissions.	Cost, higher BSFC, Viton hoses and seals required, shorter shelf life due to microbe growth (controlled with additives), higher pour point affects cold weather performance, operating practices necessary for contaminated rags, special monitoring & reporting required to assure use.
Electric standby	100% when in use at facility.	Yes	Truck: $350-$600 Trailer: $2000-$2600, plus facility infrastructure.[6]	NA	Dramatic reductions in health risk near facilities. Option now available for truck models and some trailer models.	No health risk reductions along roadways, current retrofit costs high.
Ultra-low aromatic synthetic diesel fuel: Fischer-Tropsch (GTL) Diesel	30% PM; 4-11% NOx[7]	No	$0.15 to $0.25 per gal more than CARB diesel.[8]	No	Available now. 0- 5 ppm sulfur, no aromatics in fuel – very low PAH emissions, 70+ cetane # - lower NOx.	Special monitoring & reporting required to assure use, 2-3% fuel penalty, Viton hoses and seals required, dual fuel infrastructure may be necessary, limited availability (but over 12 new plants under construction or design review for 2008 production.[9]

[1] Trade names mentioned herein do not imply ARB endorsement.
[2] Costs shown are based on best information now available. Annualized cost and cost-effectiveness will be analyzed as technologies are demonstrated.
[3] Dr. Shane Tyson, National Renewable Energy Lab; Technical Assistance Fact Sheet, U.S. Department of Energy, May 2001; R. L. McCormick, et. Al. Colorado School of Mines, "NOx Solutions for Biodiesel" Final Report to National Renewable Energy Labs, Contract No. XCO-0-30088-01.
[4] Peterson, C., Hammond, B., Reese, D., Thompson, J., Beck, S., "Performance and Durability Testing of Diesel Engines Using Ethyl and Methyl Ester Fuels", December, 1995. (Download at www.biodiesel.org.)
[5] Margi Marrero, National Biodiesel Board, 5-8-02 comments at TRU Workgroup meeting.
[6] Range of retail costs provided by ThermoKing and Carrier Transicold.
[7] California Energy Commission, "Gas-toLiquids (GTL) Fuel Fact Sheet", July 13, 2000.
[8] Gary Yowell, California Energy Commission, June 12, 2001 email to Rod Hill.
[9] See footnote 7.

Technology	PM/Nox Control Efficiency	Demonstrated in TRUs?	Cost	Verified with ARB for TRU?	Pros	Cons
Cryogenic Refrigeration (open cycle)[10]	100% PM 100% NOx	New trailer & truck models in production, hybrid systems in production for retrofit on straight truck units and under development for trailer units.	Cost models available. Unit list price is within 10% of diesel unit.	NA	Elimination of PM and NOx emissions, noise levels of 60 dB or less, available now for new truck and trailer, hybrid cryogenic systems currently available for retrofit on straight trucks.	Infrastructure for cryogenic fuel needs to be expanded for use in TRUs.
Active Particle Traps – electric regeneration (Rypos Trap)[11]	70-90% PM	No	Unknown	No	Independent of exhaust temp, sulfur level tolerant, low back pressure, no NO2 issue unless catalyzed.	Durability & cost unknown, may require generator upgrade, ash handling as hazardous waste, no CO or HC emission reduction.
Active Particle Trap – microwave regenerated[12]	95-98% PM	No	$500 - $1,000	No	Independent of Exhaust temp, sulfur level tolerant, low back pressure, low thermal mass, low power consumption	Durability needs additional testing.
Diesel Oxidation Catalysts (DOC))[13]	16-30% PM	R&D only	$400 - $600, $167 install'n, $64 - $712 annual maint.	No	Commercially available, installed on thousands of larger engines.	Sulfur content >500 ppm affects performance and durability.
CNG		Yes		NA	Available now. Reduces NOx and PM simultaneously.	Significant compliance costs for >25 hp LSI[14] Regulation, gaseous fuel supply, storage system, compression station, periodic tank inspections.
LPG		Under development		NA	Reduces NOx and PM simultaneously.	Same as CNG. Fuel cost is about twice that of conventional diesel.
Gasoline				NA	Reduces NOx & PM simultaneously, available at the pump.	Same LSI issue as for CNG and LNG, shorter engine life.

[10] Robert Geisen, Manager, Product Engineering, ThermoKing Corporation, March 13, 2002 email to Rod Hill. Also, reference Aurthur D Little Report for South Coast Air Quality Management District, February 28, 2001, SCAQMD Contract #97141.
[11] Frank DePetrillo, Rypos Inc, Innovative Clean Air Technologies proposal, "A Plan to Retrifit 3 Diesel Generatiors with Rypos/Bekaert System", February 20, 2001.
[12] Richard Nixdorf, Industrial Ceramic Solutions provided information for this entry, April 12, 2003.
[13] Nett Technologies, Catalytic Exhaust Products, Ltd; and Engelhard Corp provided the information for this entry, excerpted from the Diesel Risk Reduction Plan, Appendix IX
[14] LSI stands for ' ηe Spark-Ignited Engine.

Technology	PM/NOx Control Efficiency	Demonstrated in TRUs?	Cost	Verified with ARB for TRU?	Pros	Cons
Water emulsions-Lubrizol/PuriNox™ (Northern CA) or Chevron Texaco Proformix™[15] (Southern CA)	63% PM (74% with DOC); 14% NOx	No	$0.15 to $0.20 per gal more than CARB diesel in like quantities and like delivery distance.	No	Available now, EPA registered and verified, no engine modifications necessary, reduces NOx and PM reductions simultaneously, qualification for emission reduction credit.	Requires periodic agitation to extend shelf life, up to 20% power loss at peak power output, BSFC volumetric increase up to 15%, cold weather product not available in California.
Dual-fuel CNG/LPG Fumigation[16]	40-85% PM; 20-80% NOx	Yes	Conversion ~$800. Fuel tank cost is $4K to $4.5K for CNG, $350 for LPG. CNG - $0.98/equiv diesel gal[17]	No	Lower fuel costs (depends on current cost of fuels), reduced engine oil change frequency.	Gaseous fuel supply & storage system, compression station, periodic tank inspections, added fuel tank weight cuts into payload, marginal emission benefit at low speed/torque.
Fuel-borne Catalysts (FBC) @ 4-8 ppm [18]	10-25% PM (with no increase in the number of nanoparticles), minor reductions or no change in NOx[19]	Yes	On-board dosing system: $500-$1,000 (factory), $1500 to $3000 for field retrofit, + $0.05 to $0.10/gal. Slow release fuel filter could be $200-$300.	Clean Diesel Technologies in process. Rhodia and Lubrizol also in process for different dosing rates.	Improves fuel economy 10-20%, can be used in conjunction with a particle trap to enhance emission reduction.	Special monitoring and reporting required to assure FBC use, 5 year shelf life, if properly packaged to eliminate light exposure, higher FBC dosing rates may required trap to prevent ultrafines.
FBC + ULSD + B20 (Fuelborne catalyst plus ultra-low sulfur diesel plus 20% biodiesel)[20]	30-40% PM, No NOx increase.	No	$0.30 – 0.40/gal combined premium for biodiesel and FBC components.	No	No increase in NOx or BSFC.	Special monitoring and reporting required to assure biodiesel and FBC use. Higher FBC dosing rates may require trap to prevent ultra-fines.

[15] Lubrizol Corporation press release announcing CARB verification of PuriNox, 2-01-02; Kimberly Jones, Lubrizol Corp., 5/30/01 phone conversation with Rod Hill; Bill Hagstrand, Lubrizol Corp. email to Rod Hill, 7-7-03.
[16] Tom Sem, ThermoKing Corp., 1-29-02 email to Rod Hill and 7-29-02 follow-up questions. ARB has not reviewed detailed data.
[17] LNG cost/equivalent gallon from HEB in Texas. CNG cost/equivalent gallon from PG&E web site, 10/28/02.
[18] Jim Valentine, Clean Diesel Technologies, 9-10-02 email to Rod Hill.
[19] Valentine, J. M., Peter-Hoblyn, J. D., Acres, Dr. G. K., "Emission Reduction and Improved Fuel Economy Performance from a Bimetallic Platinum/Cerium Diesel Fuel Additive at Ultra-Low Dose Rates", SAE Paper #2000-01-1934.
[20] Information provided by Jim Valentine, Clean Diesel Technologies, 9-10-02.

Technology	PM/NOx Control Efficiency	Demonstrated in TRUs?	Cost	Verified with ARB for TRU?	Pros	Cons
Passive Particle Traps (catalyzed diesel particulate filters – CDPFs)[21]	85-95% PM	Yes, but some issues with first prototype.	MECA[22] est. $3,300 to $5,000 initial cost[23], $167 installation, $156 annual maintenance.	No	Automatic regeneration if exhaust achieves regeneration temperature for necessary duration, CO & HC reductions.	Difficult match due to low exhaust temperatures; back pressure affects fuel economy, engine performance & life; annual maint., ash handling as hazardous waste, low sulfur fuel required to avoid sulfate formation, Increased NO2 emissions with some catalysts.
FBC + ULSD + DOC[24]	30-40% PM, 10% NOx	Testing underway @ Clean Air Systems (CAS)	$300 to $500 + $0.05 to $0.10/gal.	CDT in process.	Lightly catalyzed lower cost DOC; 3-7% fuel economy improvement; No NO_2 increase.	Special monitoring and reporting required to assure FBC use. Higher FBC dosing rates may require filter to prevent ultra-fines.
FBC + ULSD + DOC + FTF (flow-through filter).[25]	50-60% PM, 10% NOx	Testing underway @ CAS	$600 to $1000 + $0.05 to $0.10/gal	CDT in process.	Lightly catalyzed lower cost DOC; 3-7% fuel economy improvement; No NO_2 increase.	Special monitoring and reporting required to assure FBC use. Higher FBC dosing rates may require filter to prevent ultra-fines.
FBC + ULSD + Lightly Catalyzed DFP[26]	85% PM, 10% NOx	Testing underway @ CAS & TRU Mfr.	$1500 to $3500 + $0.05 to $0.10/gal	No	Lightly catalyzed lower cost DPF; passive regeneration @ 280 °C – 320 °C, No BSFC penalty; No NO_2 increase.	Must match exhaust temperatures, ash handling as hazardous waste.
Fuel Cells[27]	100% PM; 100% NOx (near zero emissions)	No	Unknown	NA	Near-zero emissions, lower greenhouse gas emissions, fuel economy, quieter operation, energy diversity.	Technical issues remain to integrate components to meet consumers' performance and cost demands.

[21] Nett Technologies, Engelhard Corp, and Clean Air Systems provided the information for this entry, excerpted from the Diesel Risk Reduction Plan, Appendix IX
[22] MECA stands for Manufacturers of Emission Controls Association.
[23] ThermoKing's experience is lower initial costs than MECA's estimate.
[24] Information provided by Jim Valentine, Clean Diesel Technologies, email to Rod Hill, 9-10-02.
[25] Information provided by Jim Valentine, Clean Diesel Technologies, email to Rod Hill, 9-10-02.
[26] Information provided by Jim Valentine, Clean Diesel Technologies, email to Rod Hill, 9-10-02.
[27] ARB Fact She·· *Fuel Cell Electric Vehicles*, 1-09-02.

APPENDIX C

SUMMARY OF INFORMATION FROM MANUFACTURERS, OPERATORS, AND FACILITIES

APPENDIX C

SUMMARY OF INFORMATION FROM MANUFACTURERS, OPERATORS, AND FACILITIES

A. General Information

The table below summarizes general information gathered during the development of the Proposed Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRUs) and TRU Generator Sets, and Facilities Where TRUs Operate (proposed ATCM). Staff greatly appreciate the cooperation of the many manufacturers, operators, and facility representatives who provided information about TRUs and TRU generator sets and their operation in California.

Information Requested	Responses
TRU and TRU Generator Set Configurations	• Straight Truck Van TRU with integral engine • Straight Truck Van TRU powered off truck engine • Semi-trailer Van TRU • Semi-trailer Van TRU with TRU generator set • Domestic Shipping Container TRU with integral engines • Shipping Container TRUs with TRU generator sets • Railcar TRUs with integral engines • "Road Railer" Trailer Van TRUs with integral engines or TRU generator sets
Responsibility for Operation and Maintenance	• By owner-operator; • Under terms of lease; and/or • Under terms of other contracts or agreements
TRU and TRU Generator Set Engine Life	20,000 to 30,000 hours of operation; however, most are replaced earlier (e.g. when vehicle is replaced)
TRU and TRU Generator Set Operation	1,000 to 3,000 hours per year; most cycle on and off but will continuously operate to run a fan when cargoes require continuous air flow
Age of Semi-trailer/Truck Vans, Railcars	Current Model Year to 30 or more years
Geographic Range of Commodity Transport by Semi-trailer/ Truck Vans	• Local • Regional • Intra-state • Inter-state • Canada • Mexico • Any combination of the above
Number of TRUs Per Semi-trailer/Truck Vans	Range: 1 to 1,300
Semi-trailer/Truck Van Road Time Per Trip	Range: 20 minutes to 72 hours Average or Mode: 13 hours
Semi-trailer/Truck Van Pre-chill Time	Range: 0 to 2 hours Average: 1 hour

Information Requested	Responses
Semi-trailer/Truck Van Time From Finished Loading to Departure	Range: 0 to 24 hours
Facility Operation	The majority of facilities schedule appointments for unloading. Electrical stand-by is not commonly provided because most TRUs are not equipped to operate on electrical stand-by and installation is costly.

APPENDIX D

OFFROAD MODEL CHANGE TECHNICAL MEMO

ADDENDUM

to

OFFROAD Modeling Change Technical Memo

The OFFROAD Modeling Change Memo discussed that during the process of updating the emissions inventory for TRUs, engine manufacturers were asked to provide staff with data regarding TRU and TRU generator set PM engine emission rates. Although some manufacturers responded by providing PM emission factor estimates, no test data was received. The zero-hour rates provided by the manufacturers suggest lower zero-hour emission rates than currently assumed in the OFFROAD model. Staff attempted to validate these estimates by reviewing engine certification data in both the U.S. EPA and ARB engine certification data bases. However, using the engine models and engine families provided by the TRU engine manufacturers resulted in finding only a small fraction of the engines that have been used in TRUs since these engines required emissions certification. In the absence of new test data and engine certification data, staff chose to utilize the current OFFROAD PM emission factors.

It was noted in the OFFROAD Modeling Memo, however, that based on the manufacturers submission, the possibility exists that the zero hour emissions estimates of TRUs may be lower than currently assumed. To get an estimate of the potential magnitude of this difference, staff used the PM emission factors provided by the engine manufacturers to estimate the year 2000 statewide fleet average PM emissions factors for each horsepower category. Staff substituted the average manufacturer PM emission factor for each model year in which data was available from all engine manufacturers supplying engines in a horsepower category. The OFFROAD Model PM emission factors were applied to those model years where data was not available from all engine manufacturers supplying engines in a horsepower category. These factors were applied to the remaining model year populations of TRU and TRU generator sets that were modeled to be in use in year 2000. Deterioration factors from the OFFROAD Model and fuel factors that adjust emissions for sulfur content were applied. This produced a statewide PM emission factor that averaged 25percent less considering all horsepower categories than what was estimated using just the OFFROAD Model emission factors.

This difference was determined to be large enough to warrant an adjustment in the PM Emissions for years 2000 through 2020. The values that were calculated from the OFFROAD Model were multiplied by 75 percent to revise the PM emissions for 2000 from 2.65 tons per day to 1.98 tons per day and for 2010, the PM emissions were revised similarly from 3.19 tons per day to 2.23 tons per day. Table D-1 shows these revised emissions. Table D-1 also includes the assumptions that Tier 4 Nonroad emission standards would be implemented in 2008 ("interim standards) and 2013 ("long term standards) and that the ATCM would be implemented according to the proposed schedule.

Table D-1

TRU and TRU Generator Sets In Use Compliance Program Emissions Benefit

For Particulate Matter (PM) Emissions

CY	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<15														
Baseline tpd	0.044	0.043	0.041	0.040	0.038	0.037	0.036	0.035	0.034	0.034	0.034	0.034	0.034	0.034
After tpd	0.044	0.043	0.033	0.032	0.029	0.027	0.025	0.024	0.022	0.022	0.022	0.023	0.024	0.025
Benefit tpd	0.000	0.000	0.008	0.008	0.009	0.010	0.011	0.012	0.012	0.012	0.011	0.011	0.010	0.010
15-25														
Baseline tpd	0.026	0.025	0.024	0.023	0.023	0.022	0.021	0.021	0.020	0.020	0.020	0.020	0.020	0.020
After tpd	0.026	0.025	0.019	0.019	0.017	0.016	0.015	0.014	0.013	0.013	0.013	0.013	0.014	0.014
Benefit tpd	0.000	0.000	0.005	0.005	0.005	0.006	0.006	0.007	0.007	0.007	0.007	0.006	0.006	0.006
25-50ca														
Baseline tpd	1.599	1.568	1.527	1.481	1.431	1.375	1.265	1.155	1.045	0.931	0.819	0.711	0.613	0.524
After tpd	1.599	1.568	1.131	1.075	0.963	0.880	0.754	0.631	0.506	0.396	0.380	0.308	0.245	0.180
Benefit tpd	0.000	0.000	0.396	0.405	0.467	0.495	0.511	0.524	0.539	0.535	0.439	0.403	0.368	0.345
25-50fed														
Baseline tpd	0.528	0.517	0.504	0.489	0.472	0.454	0.418	0.381	0.345	0.307	0.270	0.235	0.202	0.173
After tpd	0.528	0.517	0.373	0.355	0.318	0.290	0.249	0.208	0.167	0.131	0.125	0.102	0.081	0.059
Benefit tpd	0.000	0.000	0.131	0.134	0.154	0.163	0.169	0.173	0.178	0.176	0.145	0.133	0.122	0.114
25-50rail														
Baseline tpd	0.120	0.118	0.115	0.111	0.107	0.102	0.094	0.085	0.077	0.069	0.060	0.052	0.045	0.039
After tpd	0.120	0.118	0.084	0.080	0.072	0.065	0.056	0.047	0.037	0.029	0.028	0.023	0.018	0.013
Benefit tpd	0.000	0.000	0.030	0.031	0.035	0.037	0.038	0.039	0.040	0.040	0.032	0.030	0.027	0.025
25-50gensets														
Baseline tpd	0.084	0.084	0.085	0.085	0.086	0.087	0.083	0.078	0.073	0.067	0.060	0.053	0.047	0.042
After tpd	0.084	0.084	0.069	0.067	0.063	0.060	0.053	0.046	0.038	0.031	0.031	0.026	0.021	0.016
Benefit tpd	0.000	0.000	0.016	0.018	0.023	0.027	0.030	0.033	0.035	0.035	0.029	0.028	0.026	0.025

Sums from above

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Baseline w/ Tier 4	1.98	2.1	2.2	2.3	2.35	2.4	2.43	2.401	2.356	2.296	2.228	2.156	2.077	1.917	1.756	1.594	1.427	1.262	1.104	0.962	0.832
With TRU ATCM	1.98	2.1	2.2	2.3	2.35	2.4	2.43	2.401	2.356	1.710	1.628	1.462	1.338	1.152	0.970	0.783	0.623	0.599	0.495	0.402	0.307
Em Reduxns (tpd)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.586	0.600	0.695	0.739	0.765	0.786	0.811	0.805	0.664	0.610	0.559	0.525
Em Redux (tpy)	0	0	0	0	0	0	0	0	0	214	219	254	270	279	287	296	294	242	223	204	191

"Baseline" includes the effects of implementing "interim" Tier 4 Nonroad standards in 2008 and "long term" Tier 4 in 2013.

"After" includes the effects of implementing the TRU ATCM in-use performance standards with the following assumptions:

- 50% reduction for model year 2001 and previous, starting 2009 (December 31, 2008 compliance date).
- 50% reduction for model year 2002, starting 2010 (December 31, 2009 compliance date).
- 85% reduction for model years 2003 and subsequent, starting 7 years after model year (December 31, 2010 compliance date for 2007).
- 85% reduction for model year 2001 and previous, starting 2016 (December 31, 2015 compliance date).
- 85% reduction for model year 2002, starting 2017 (December 31, 2016 compliance date).

Staff plans to continue the effort to identify the certified emission values for all TRU engines that have been certified and the related deterioration factors that would apply. These factors will be used to improve the accuracy of the TRU and TRU generator set emission inventory.

TRU and TRU generator set NOx emissions were estimated using the OFFROAD Model as shown in Table D-2. The estimate included the assumptions that the Tier 4 Nonroad emission standards would be implemented in 2008 ("interim standards) and 2013 ("long term standards) and that there would be a 10 percent NOx reduction associated with implementation of the TRU ATCM.

Table D-2

TRU and TRU Generator Sets In Use Compliance Program Emissions Benefit														
			For Oxides of Nitrogen (NOx) Emissions											
CY	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<15														
Baseline tpd	0.832	0.822	0.814	0.807	0.804	0.805	0.809	0.819	0.838	0.860	0.887	0.918	0.954	0.995
After tpd	0.832	0.822	0.780	0.775	0.772	0.773	0.780	0.791	0.811	0.833	0.860	0.891	0.926	0.966
Benefit tpd	0.000	0.000	0.034	0.033	0.032	0.031	0.030	0.028	0.027	0.027	0.027	0.027	0.028	0.029
15-25														
Baseline tpd	0.474	0.474	0.474	0.475	0.476	0.479	0.482	0.487	0.494	0.503	0.513	0.525	0.538	0.553
After tpd	0.474	0.474	0.456	0.456	0.458	0.460	0.464	0.470	0.478	0.486	0.496	0.508	0.521	0.536
Benefit tpd	0.000	0.000	0.018	0.018	0.018	0.018	0.018	0.017	0.017	0.016	0.017	0.017	0.017	0.017
25-50ca														
Baseline tpd	15.202	15.550	15.933	16.368	16.874	17.442	17.392	17.419	17.486	17.578	17.706	17.859	18.059	18.298
After tpd	15.202	15.550	15.336	15.769	16.267	16.835	16.783	16.798	16.845	12.057	17.152	17.279	17.449	17.655
Benefit tpd	0.000	0.000	0.597	0.600	0.607	0.607	0.609	0.621	0.641	5.521	0.554	0.580	0.610	0.643
25-50fed														
Baseline tpd	5.017	5.132	5.258	5.402	5.569	5.756	5.740	5.748	5.771	5.801	5.843	5.894	5.960	6.038
After tpd	5.017	5.132	5.061	5.204	5.368	5.556	5.539	5.544	5.559	3.979	5.660	5.702	5.758	5.826
Benefit tpd	0.000	0.000	0.197	0.198	0.200	0.200	0.201	0.205	0.212	1.822	0.183	0.191	0.201	0.212
25-50rail														
Baseline tpd	1.120	1.146	1.174	1.206	1.243	1.285	1.282	1.284	1.288	1.295	1.305	1.316	1.331	1.348
After tpd	1.120	1.146	1.130	1.162	1.199	1.241	1.237	1.238	1.241	0.888	1.264	1.273	1.286	1.301
Benefit tpd	0.000	0.000	0.044	0.044	0.045	0.045	0.045	0.046	0.047	0.407	0.041	0.043	0.045	0.047
25-50gensets														
Baseline tpd	0.914	0.978	1.051	1.136	1.232	1.341	1.391	1.451	1.515	1.585	1.665	1.755	1.858	1.974
After tpd	0.914	0.978	1.025	1.106	1.200	1.306	1.353	1.409	1.469	1.175	1.623	1.710	1.809	1.921
Benefit tpd	0.000	0.000	0.026	0.029	0.032	0.035	0.039	0.042	0.046	0.410	0.042	0.045	0.049	0.053
Total Benefit tpd	0.000	0.000	0.916	0.922	0.935	0.937	0.941	0.958	0.990	8.203	0.862	0.903	0.950	1.002

Prepared by Sandee Kidd
Date October 9, 2003
In use compliance scenario provided by Toni Andreoni is shown in the worksheet "compliance".

"Baseline" emissions assume that Tier 4 Nonroad standards are implemented in 2008 ("interim" standards) and 2013 ("long term" sta
"After" emissions includes the effects of implementing the TRU ATCM in-use performance standards and assumes a 10% NOx reduc

OFFROAD Modeling Change Technical Memo

SUBJECT: Revisions to the Diesel Transport Refrigeration Units (TRU) Inventory

LEAD: Sandee Kidd

SUMMARY

Transport refrigeration units (TRUs) are diesel powered cooling units that are installed on vehicles used in transporting produce, meat, dairy products, and other perishable goods. TRUs are found on refrigerated vans, trucks, trailers, and railroad cars.

TRU emissions are estimated in the Air Resources Board's (ARB or Board) OFFROAD model. Since late 2002, ARB staff obtained more up to date population and activity estimates from surveys of TRU manufacturers. We analyzed these data and are proposing to use the results to revise the input factors to the OFFROAD model. Staff proposes to revise the population, activity, load factor, average horsepower, survival rates, and useful life estimates for TRUs. These modifications are projected to decrease the emissions inventory of oxides of nitrogen (NOx) by 6.72 tons per day, and increase hydrocarbons (HC) by 4.60 tons per day and particulate matter (PM) by 0.03 tons per day, statewide in the year 2000 (See Table 1). For 2010, the emissions inventory is projected to increase by 0.84 tons per day for PM, 4.31 tons per day for NOx, and 4.61 tons per day for HC compared to the current estimates (See Table 2).

Table 1
Statewide TRU Emissions Inventory in Tons per Day in 2000

	PM	PM	NOx	NOx	HC	HC
Horsepower	**Existing**	**Proposed**	**Existing**	**Proposed**	**Existing**	**Proposed**
<15 hp	NA	0.06	NA	0.84	NA	0.11
15-25-hp	0.02	0.04	0.20	0.44	0.03	0.09
25-50 hp (CA)	0.43	1.82	2.80	12.67	1.64	6.75
25-50 hp Out-of-state	NA	0.60	NA	4.18	NA	2.22
25-50 hp (Rail)	NA	0.13	NA	0.93	NA	0.49
> 50 hp	2.17	NA	22.78	NA	3.39	NA
Totals	**2.62**	**2.65**	**25.78**	**19.06**	**5.06**	**9.66**

Table 2
Statewide TRU Emissions Inventory in Tons per Day in 2010

	PM	PM	NOx	NOx	HC	HC
Horsepower	**Existing**	**Proposed**	**Existing**	**Proposed**	**Existing**	**Proposed**
<15 hp	NA	0.06	NA	0.81	NA	0.09
15-25-hp	0.01	0.04	0.15	0.47	0.02	0.06
25-50 hp (CA)	0.40	2.20	2.64	16.37	1.35	6.11
25-50 hp Out-of-state	NA	0.73	NA	5.40	NA	2.02
25-50 hp Rail	NA	0.16	NA	1.21	NA	0.45
> 50 hp	1.94	NA	17.16	NA	2.56	NA
Totals	**2.35**	**3.19**	**19.95**	**24.26**	**3.93**	**8.74**

BACKGROUND

The emissions inventory for TRUs is calculated in the OFFROAD model in tons per day using the following equation:

Emission Inventory = Emission Rate*Population*Activity*Average Horsepower*Load Factor

The emission rates are pollutant specific and are expressed in grams/horsepower-hour (gms/hp-hr). Activity is expressed in hours/year or hours/day of engine run time. The "average horsepower" is defined as the average maximum rated horsepower within each horsepower group. The "load factor" is the average operation level in a given application and is expressed as a percent of the engine manufacturer's maximum horsepower ratings. The population estimate is a function of original sales, useful life and survival rate of the equipment.

With the exception of the emission rates, all other factors used in the current emissions inventory calculations were obtained from the 1997 Power Systems Research (PSR) report. PSR is an independent marketing firm involved in research and development related to engine product life cycles. The ARB approved the current emission inventory for diesel-powered TRUs in January of 2000.

INPUT FACTORS

Useful Life

Useful life is defined as the age at which at least fifty percent of the originally sold equipment population still exists. However, some of the remaining engines could last twice as long. Currently, the useful life for TRU's in the OFFROAD model is assumed to be 16 years. The staff proposes to reduce this estimate to 10 years based on the responses to the survey of TRU manufacturers.

Survival Rate

The survival rate curve describes the percentage of the original equipment population remaining in the fleet as a function of age. For TRU's, this estimate was obtained from the PSR database. However, based on conversations with manufacturers, it was determined that in the last ten years, the trend showing a rapid decrease in the population may not be realistic. Therefore, the survival rate of TRUs 11 to 20 years old was revised to reflect a more gradual decrease in population. In addition, survival rate for age 0 was modified from 0.5 to 1.0 to reflect that age 0 includes sales for the entire calendar year. Table 3 compares the survival rates from PSR at the useful life of 10 and 16 years, to the proposed survival rate.

TRU Sales

The current estimate of the population of TRUs by horsepower group was obtained from PSR. The proposed revision to the population was derived from national TRU sales data provided by TRU manufacturers and TRU engine manufacturers, reported for a twelve year period between 1991 and 2002 for each horsepower category. A curve fit of the data was performed to estimate the sales going back to 1981 for each horsepower category (See Charts 1, 2, and 3). The "Original Sales" data shown in Charts 1, 2, and 3 represent an estimate of the number of TRUs originally sold in a particular year in the entire U.S. and should not be confused with the actual population in a given calendar year.

Using the 1997 Commodity Flow Survey data from the U.S. Census Website (www.census.gov), it was determined that the truck ton-mile share in California compared to the entire U.S. for refrigerated goods is 6.4 percent. Refrigerated goods include meats, agricultural products and other prepared perishable goods. Therefore, 6.4 percent of the U.S. TRU sales in all horsepower groups were assumed to be in California.

Table 3
Comparison of TRU Survival Rates from Original Sales (%)

Age	Current (PSR) Survival Rate Useful Life = 10	Proposed Survival rate Useful Life = 10	Current (PSR) Survival rate Useful Life = 16
0	0.50	1.00	0.50
1	0.98	0.98	0.99
2	0.97	0.97	0.98
3	0.95	0.95	0.97
4	0.92	0.92	0.96
5	0.90	0.90	0.95
6	0.87	0.87	0.93
7	0.83	0.83	0.91
8	0.80	0.80	0.90
9	0.75	0.75	0.88
10	0.50	0.67	0.84
11	0.25	0.59	0.83
12	0.20	0.49	0.82
13	0.17	0.38	0.80
14	0.13	0.26	0.76
15	0.10	0.12	0.70
16	0.08	0.08	0.50
17	0.05	0.05	0.30
18	0.03	0.03	0.24
19	0.02	0.02	0.20
20	NA	NA	0.18
21	NA	NA	0.17
22	NA	NA	0.16
23	NA	NA	0.12
24	NA	NA	0.10
25	NA	NA	0.09
26	NA	NA	0.07
27	NA	NA	0.05
28	NA	NA	0.04
29	NA	NA	0.028
30	NA	NA	0.017
31	NA	NA	0.010
32	NA	NA	0.005

Chart1: TRU U.S. Sales for < 15 hp engines

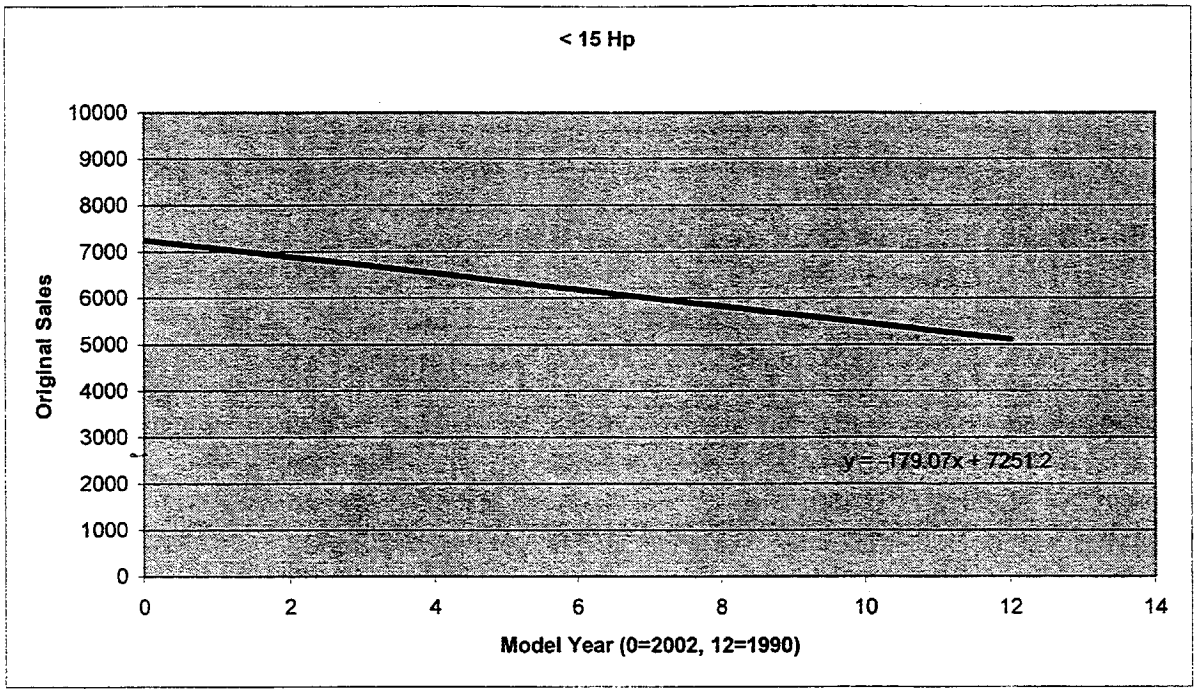


Chart 2: TRU U.S. Sales for 15-25 hp engines

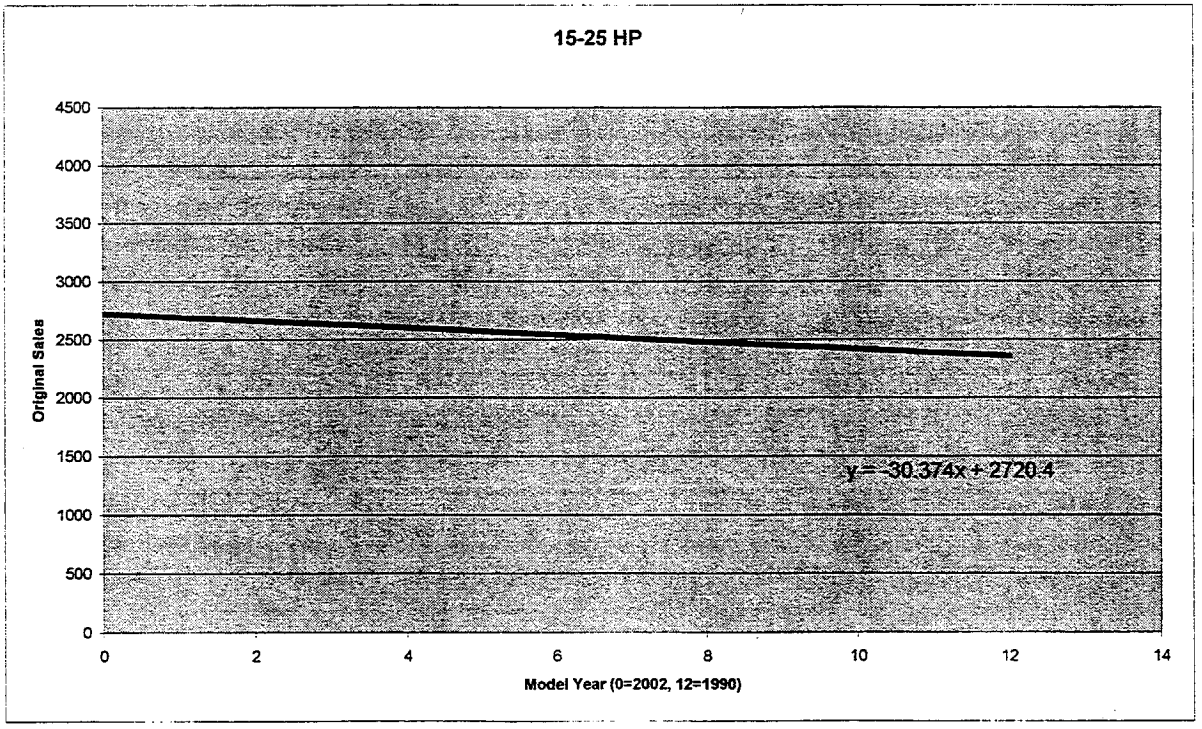
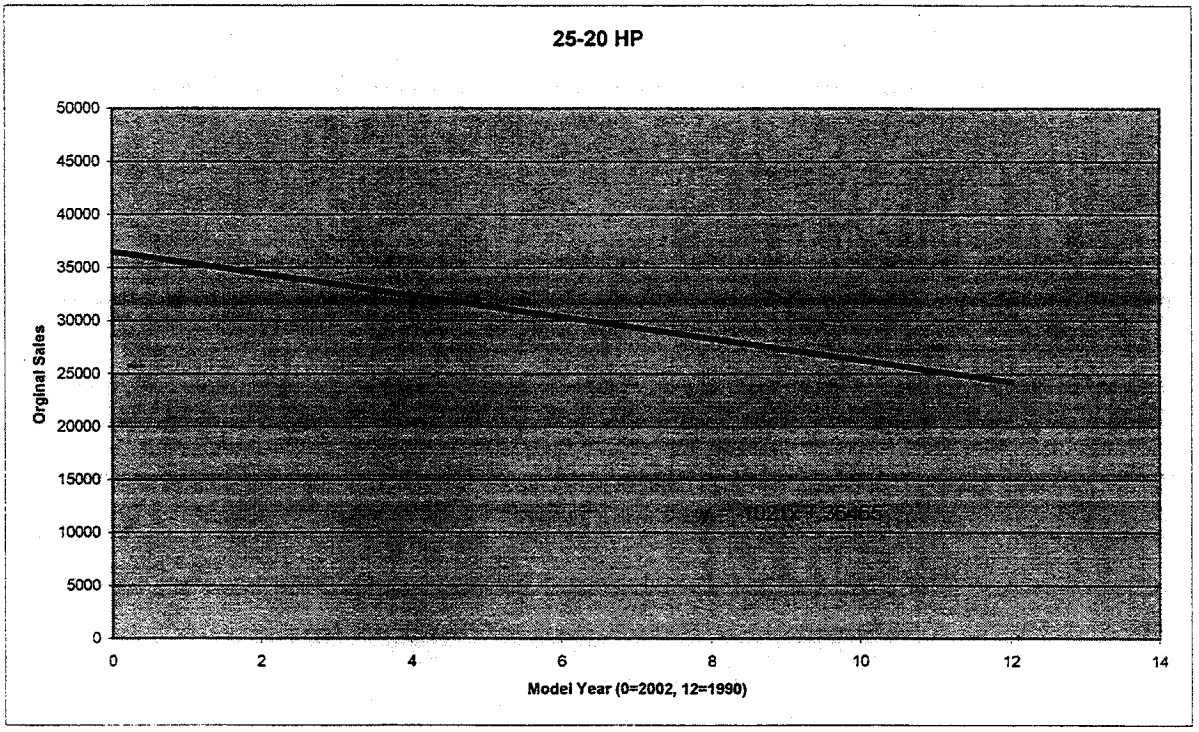


Chart 3: TRU U.S. Sales for 25-50 hp engines



Population

(CALIFORNIA REGISTERED TRU)

Using the manufacturers sales data and sales equations, 20 years of sales were estimated and the revised survival rates were applied to update the TRU population assumed to be installed on California registered, on-road vehicles as shown in Table 4. These numbers will be used in the offroad model.

(Out of State TRU)

In California's on-road vehicle emissions inventory model, EMFAC2002, it is assumed that 25 percent of the total heavy-heavy duty diesel (HHDD) truck population that travels on California roads are trucks registered outside of California. This equates to 33 percent of the California only HHDD trucks. Using the estimate cited above for the 25-50 hp category, staff included an additional 7,515 TRUs into the 25-50 hp group to account for TRUs operating in California that are installed on trucks registered out of state. For purposes of emissions calculation, staff assumed that these out of state TRUs have the same age distribution and usage as TRUs installed on California registered trucks.

(Railcar TRUs)

ARB staff also sent surveys to several railroad operators that do business in California regarding the use of refrigerated railcars. Staff used the American Association of Railroads UMLER files to obtain the U.S. population of railcars with mechanical refrigeration systems (reefer railcars). Reefer railcars use TRUs in the 25-50 hp group. Using the Commodity Flow Survey data mentioned earlier, it was determined that the rail ton-miles in California compared to the entire U.S. for refrigerated goods is 19 percent. Therefore, 19 percent of the U.S. reefer railcar usage was assumed to occur in California. Due to the lack of additional information, staff again assumed the same age distribution and usage for railcar TRUs as that used for TRUs that are installed on California registered trucks (See Table 4).

Table 4
Statewide TRU Population in CY 2000

Horsepower Group	Existing Population	Proposed Population
<15 hp (Ca)	0	4623
15-25 hp (Ca)	1517	1947
25-50 hp (Ca)	8412	22772
25-50 hp (Out of State)	0	7515
25-50 hp (Rail)	0	1678
>50 hp	30902	0
Total	**40831**	**38535**

Unlike the existing estimates in the OFFROAD model, data provided by manufacturers and railroad operators indicated that there are a significant number of TRUs under 15 hp and there are no TRUs over 50 hp.

Average Horsepower, Load Factor, and Usage

Each engine in a specific application is assumed to operate for the average annual number of hours at the average load factor number. The average horsepower values, load factor, and usage estimates currently used in the OFFROAD model were taken from the PSR database. Survey responses obtained from the manufacturers also provided data to update these estimates. The revised estimates are compared to current estimates in Table 6 that summarizes all of the current and proposed input factors used to calculate the TRU emissions inventory.

Growth Factors

Growth factors (GF) used to forecast yearly sales beyond the year 2000 are derived from socio-economic indicators (e.g., housing units and manufacturing employment) that are assumed to have a close relationship with the off-road equipment categories. Growth factors contained in the OFFROAD model were obtained from the 1994 study by California State University, Fullerton (CSUF) entitled "A study to Develop Projected Activity for Non-Road Mobile Categories in California, 1970-2020." Growth factors for the proposed revisions of the OFFROAD model for the TRU category are derived from the average growth indicated by yearly sales data provided by the manufacturers. Actual, rather than average growth factors were used for years where the sales data were available. Table 5 shows the growth factors by hp for 2003+ calendar years.

Table 5
Yearly Growth Factors for TRU for Calendar years 2003+

HP	GF (%)
<15	4.58
15-25	3.04
25-50	5.20

Table 6
TRU Input Factors

HP GROUPS	<15 hp	15-25 hp	25-50 hp	>50 hp
Average hp				
Existing	NA	17	39	56
Proposed	10	17	34	NA
Activity (hrs/yr)				
Existing	NA	750	1341	1341
Proposed	1038	1038	1465	NA
Load Factor				
Existing	NA	0.50	0.28	0.28
Proposed	0.64	0.64	0.53	NA
Population (CY 2000)				
Existing	0	1517	8412	30902
Proposed	4623	1947	31965	NA
Useful Life (yrs)				
Existing	NA	6	16	16
Proposed	10	10	10	NA
Fleet Average NOx gms/hp-hr (CY 2000)				
Existing	NA	6.82	7.53	11.61
Proposed	9.04	6.64	6.89	NA
Fleet Average PM gms/hp-hr (CY 2000)				
Existing	NA	0.60	1.15	1.10
Proposed	0.65	0.57	1.00	NA
Fleet Average HC gms/hp-hr (CY2000)				
Existing	NA	1.03	4.04	1.73
Proposed	1.19	1.28	3.72	NA

Emission Rates

The emission rates used in this analysis are those currently used in the OFFROAD model. These rates are based on pre-1995 diesel fuel. Fuel correction factors are applied in the model to reflect lower emissions due to low sulfur and aromatic content of 1995+ diesel fuel in California. Staff is not proposing to modify these estimates at this time (See Attachment A). Although the basic emission rates did not change, the proposed fleet average emissions as shown in Table 6 differ because the population distribution has been revised.

During the process of updating the emissions inventory for TRUs, engine manufacturers were asked to provide staff with data regarding their emission rates. Although some manufacturers responded by providing emission factor estimates, no test data was received. The zero hour rates provided by the manufacturers suggest lower zero hour

emission rates than currently assumed in the OFFROAD model. Staff attempted to validate these estimates using certification data but found that only a small fraction of the in-use engines was represented in the manufacturers' submissions.

In the absence of new test data, staff chose to utilize the current OFFROAD emission factors. It should be noted, however, that based on the manufacturer submission, the possibility exists that the zero hour emissions estimates of TRUs may be lower than currently assumed. The current inventory reflect our best available estimate but the inventory will continue to be refined and improved as more data is collected.

GENERATOR SETS FOR TRUS (25-50HP)

The methodology used to estimate the emission inventory for generator sets used in TRU applications is similar to that described earlier in this document. Sales data were provided by generator set manufacturers for a ten year period between 1991 and 2000. Similar to TRUs, a curve fit of the data was performed to estimate the sales going back to 1981. Based on TRU generator set manufacturer's responses to ARB's surveys, the average horsepower, load factor and the activity was assumed to be 31 hp, 0.45 and 1100 hours per year, respectively. The useful life used was 10 years, which is the same as used for TRUs. In addition, emission factors used are the same as TRUs. Based on yearly sales data the yearly average growth factor was determined to be 10.2 percent. Table 7 shows the population along with the emissions in tons per day for the years 2000 and 2010.

Table 7
Statewide TRU Related Generator Sets for TRUs Emissions Inventory
(tons per day)

	PM Proposed	NOX Proposed	HC Proposed	POPULATION Proposed
CY 2000	0.08	0.59	0.29	1844
CY 2010	0.13	1.14	0.30	4870

REASON FOR CHANGE

In support of pending regulation and in light of new data made available by TRU manufacturers, staff is proposing to update the emissions inventory for this segment of the off-road engine population as outlined above.

METHODOLOGY

The current estimates of population, average horsepower, activity and load factor will be updated to conform to the data recently provided by TRU manufacturers. Reflecting these proposed changes will affect the emissions inventory for this category of engines.

Attachment A

MY Specific Emission Rates for Diesel Engines

		ZH	DR	ZH	DR	ZH	DR	ZH	DR
		(g/hp-hr)	(g/hp-hr2)	(g/hp-hr)	(g/hp-hr2)	(g/hp-hr)	(g/hp-hr2)	(g/hp-hr)	(g/hp-hr2)
HP	Year	ROG	ROG	CO	CO	NOX	NOX	PM	PM
15	1994	1.50	0.00	5.00	0.00	10.00	0.00	1.00	0.00
15	1999	1.05	0.00	5.00	0.00	9.35	0.00	0.57	0.00
15	2004	0.68	0.00	3.47	0.00	6.08	0.00	0.47	0.00
15	2020	0.49	0.00	3.47	0.00	4.37	0.00	0.38	0.00
25	1994	1.84	0.00	5.00	0.00	8.92	0.00	0.764	0.00
25	1999	0.90	0.00	5.00	0.00	5.92	0.00	0.573	0.00
25	2004	0.64	0.00	2.34	0.00	5.79	0.00	0.382	0.00
25	2020	0.51	0.00	2.34	0.00	4.87	0.00	0.382	0.00
50	1987	1.84	2.35E-04	5.00	5.13E-04	6.90	1.04E-04	0.76	5.89E-05
50	1998	1.80	2.30E-04	5.00	5.13E-04	6.90	1.04E-04	0.76	5.89E-05
50	2003	1.45	1.85E-04	4.10	4.20E-04	5.55	1.03E-04	0.60	4.65E-05
50	2004	0.64	9.80E-05	3.27	3.34E-04	5.10	9.33E-05	0.43	3.36E-05
50	2005	0.37	6.90E-05	3.00	3.05E-04	4.95	9.67E-05	0.38	2.93E-05
50	2007	0.24	5.45E-05	2.86	2.90E-04	4.88	9.83E-05	0.35	2.72E-05
50	2020	0.10	4.00E-05	2.72	1.27E-04	4.80	1.00E-04	0.32	2.50E-05

*NOTE:		
	15	0 to 15 hp
	25	16 to < 25 hp
	50	25 to 50 hp

Composite Emission Factor = ZH + (DR * cumulative hours)

ZH - Zero hour

DR - Deterioration rate

APPENDIX E

METHODOLOGY FOR ESTIMATING THE POTENTIAL HEALTH IMPACTS FROM DIESEL TRANSPORT REFRIGERATION UNIT ENGINES

Methodology

This appendix presents the methodology used to estimate the potential cancer risk from exposure to diesel particulate matter (diesel PM) from Transport Refrigeration Units (TRU) with diesel engines. This methodology was developed to assist in the development of the proposed *Airborne Toxic Measure for In-Use Diesel-Fueled Transport Refrigeration Units and TRU Generator Sets, and Facilities where TRUs Operate.* The assumptions used to determine these potential cancer risks are not based on TRUs at a specific distribution facility, rather a generic (i.e. example) facility was developed. The source parameters selected include a broad range of possible operating scenarios. These estimated risks are used to provide an approximate range of potential risk levels from diesel TRU engine operations. Actual risk levels will vary due to site specific parameters, including the number of TRUs operating, emission rates, operating schedules, site configuration, site meteorology, and distance to receptors.

The methodology used in this risk assessment is consistent with the Tier-1 analysis presented in the draft OEHHA, Air Toxics Hot Spots Program Risk Assessment Guidelines: The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments (OEHHA, 2003). These OEHHA draft guidelines and this assessment utilize health and exposure assessment information that is contained in the Air Toxics Hot Spot Program Risk Assessment Guidelines, Part II, Technical Support Document for Describing Available Cancer Potency Factors (OEHHA, 2003); and the Air Toxics Hot Spot Program Risk Assessment Guidelines, Part IV, Technical Support Document for Exposure Analysis and Stochastic Analysis (OEHHA 2000), respectively.

The cancer health risk estimates provide "qualitative" assessment of the potential impacts due to the operation of diesel TRUs. Actual cancer health risks will depend on actual site specific parameters, including number of diesel TRUs operating at the facility, diesel particulate emission rates, facility operation schedules and configuration, and site meteorology. Actual risk will also vary depending on the distance a receptor is from the facility, the duration of exposure, and the inhalation rate.

A. Source Description

Potential cancer health risks due to diesel TRU operations are from emissions of diesel particulate matter (diesel PM). For these analyses, the emission sources were characterized as area sources where trailers equipped with diesel TRUs were expected to operate. Sensitivity studies were done to show that the point of maximum impact, usually the property boundary, shows little difference between characterizing the emissions as an area source comprised all TRU emissions or as numerous small point sources. These studies are shown in Appendix F.

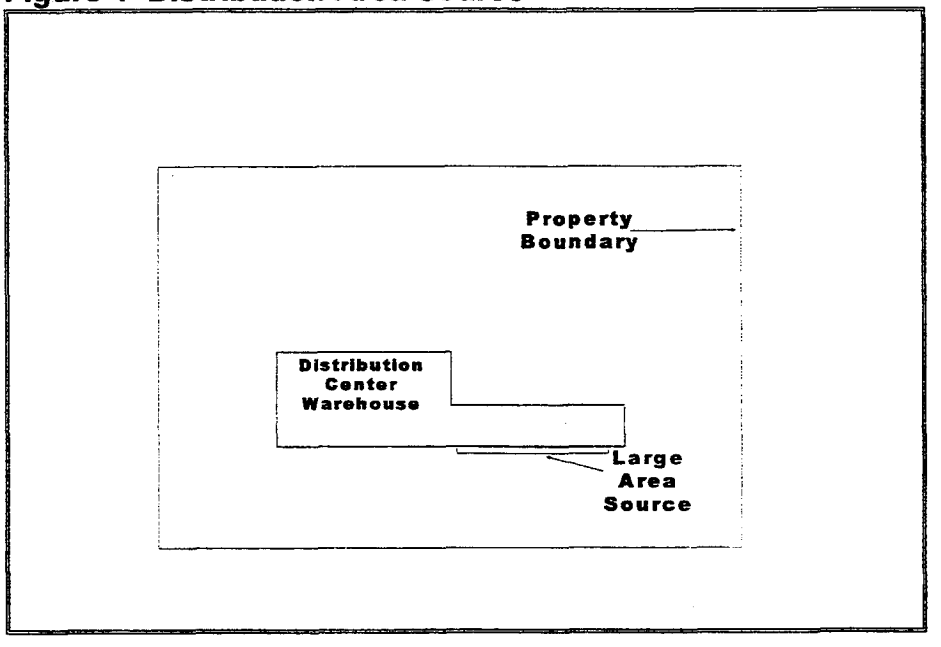
The area source is modeled where the trailers sit while pulling down the trailers' interior temperature, filling the trailer with perishables, or delivering perishable goods. The distribution center sources were characterized as small, medium, and large areas of emissions. This section describes the parameters and results from the large distribution

center area source (Figure 1). This figure is only given as an illustration of the modeling layouts and is not to scale.

The diesel TRUs operating within the large area source were assumed to be 35 horsepower (hp) with a 60 percent load factor and engine run time (no cycle-off time) as shown in Table 2 through Table 6. The hourly emission rate was conservatively assumed to be 0.7 grams per hp-hour (g/hp-hr), which is slightly less than the ARB year 2000 OFFROAD composite average model emission rate. Analyses were also developed using other diesel PM emission rates, including 1.0, 0.3, 0.22, and 0.02 g/hp-hr. Operation of the diesel TRUs within the area source was assumed to occur between 2 PM and 7AM, 7 days per week.

Sensitivity studies were done to determine buoyancy and final plume height achieved due to stack gas temperature and upward velocity. These studies led to the determination of a daytime and nighttime plume height used for the initial area source height, as shown in Table 1.

Figure 1 Distribution Area Source



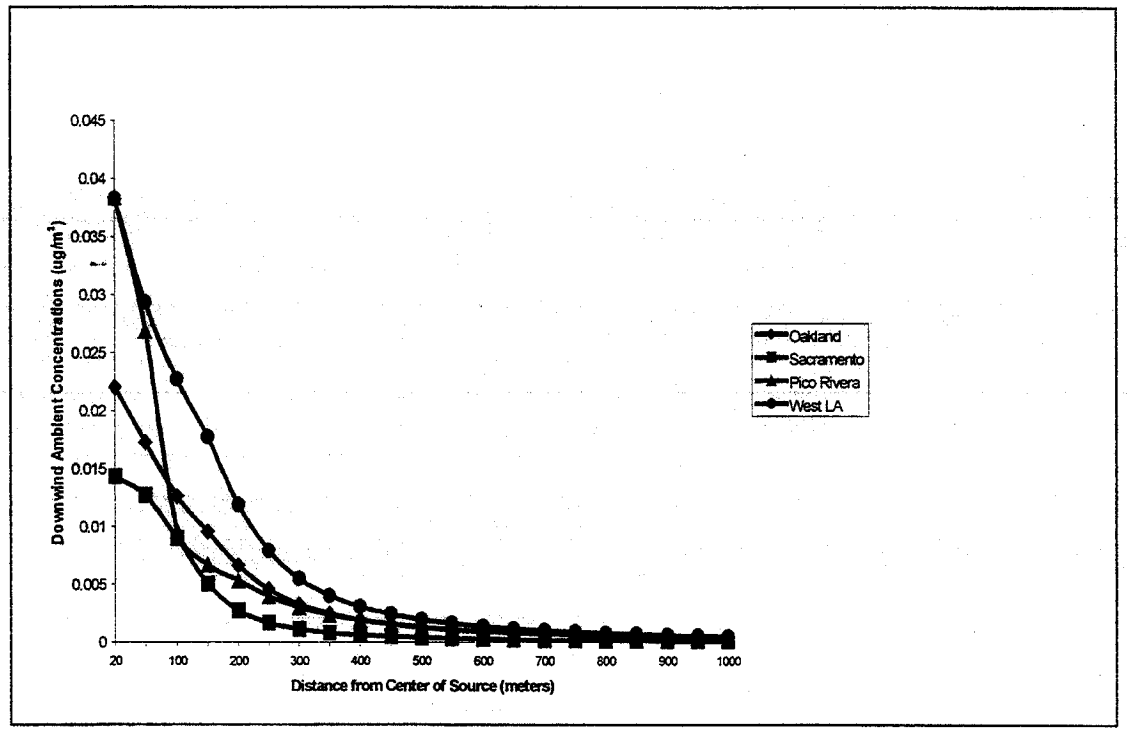
B. Dispersion Modeling Methods

The dispersion of the diesel PM emissions was estimated using the United States Environmental Protection Agency (U. S. EPA) ISCST3. ISCST3 can estimate potential ambient annual average concentrations of diesel PM as a result of diesel PM emissions from area sources.

The analyses used actual meteorological data collected at the West Los Angeles meteorological site during 1981. The West Los Angeles meteorological data provides a more conservative estimate of risk than most of the other 30 meteorological data sets

available to ARB because this site tends to have lower average wind speeds predominantly from the same direction resulting in less dispersion of pollutants. Other representative meteorological data reviewed for these analyses include Sacramento, Oakland, and Pico Rivera. Figure 2 shows a comparison of maximum concentrations for the 4 meteorological data sets used for this assessment.

Figure 2 Comparison of Downwind Ambient Concentrations based on Four Meteorological Data Sets Used



Polar coordinate receptors were placed at specific incremental distances from the area sources to determine the maximum off-site impacts. For the large area source, receptors were placed at 50 meter increments from 100 meters to 500 meters and at 100 meter increments from 500 meters to 800 meters. Table 1 shows the source and modeling parameters used for this assessment.

Table 1: Dispersion Modeling Parameters

Source Type	area
Dispersion Setting	urban
Receptor Height	1.5 meters
Initial Vertical Dispersion Parameter (σ_z)	2.5 meters
Area Source Width	16.8 meters
Area Source Length	218.8 meters
PM Emission Factor	0.7 grams/hp-hr
Day (7 AM to 7 PM) Plume Height	4.46 meters
Night (7 PM to 7 AM) Plume Height	12.79 meters

C. Health Risk Assessment Methods

Maximum offsite concentrations were used to estimate potential cancer risk due to emissions of diesel PM. The maximum offsite ambient annual concentration, in micrograms per cubic meter (μg/m^3), is applied to the unit risk factor (URF) developed for diesel PM by OEHHA. This URF is 300 excess cancers per million people per μg/m^3 of exposure to diesel PM and assumes a residential exposure of 70 years. Other exposure parameters in OEHHA risk assessment guidelines (OEHHA, 2000 and OEHHA, 2003), including the revised breathing rate and cancer potency factor, are reflected in the assessment results.

Table 2 through Table 6 present the estimated range of potential cancer health risks at nearby receptor locations due to exposures to five diesel TRU PM emission rates (0.7, 1.0, 0.3, 0.22, and 0. 2 g/hp-hr) from a large area source. The cancer health risks are shown based on hours of diesel TRU operation and downwind distance of the receptor. The horizontal line shaded boxes show where potential cancer risks are greater than or equal to (≥) 100 per million. The grey shaded boxes show where potential cancer risks are less than (<) 10 per million. The unshaded boxes show where the potential cancer risk is ≥ 10 and < 100 per million.

Table 2 Estimated Range of Potential Cancer Health Risks (per million) due to TRUs Operating at a Large Distribution Area Source – 0.7 g/bhp-hr

Total Hours of TRU Engine Operation		Downwind Distance (m) from Center of Area Source											
Per Week	Per Year	100	150	200	250	300	350	400	450	500	600	700	800
100	5,200												
150	7,800												
200	10,400												
250	13,000												
300	15,600												
350	18,200												
400	20,800												
450	23,400												
500	26,000												
600	31,200												
700	36,400												
800	41,600												
900	46,800												
1,000	52,000												
1,100	57,200												
1,200	62,400												
1,300	67,600												
1,400	72,800												
1,500	78,000												

Meteorological Data: West LA (1981)
Emission Parameters: Engine Size - 35 hp, Engine Load Factor - 60%, Area Source.
Grey Shading shows Cancer Risks < 10/million
No Shading shows Cancer Risks ≥ 10/million and < 100/million
Horizontal Line Shading shows Cancer Risks ≥ 100/million
Annual emissions assume 52 weeks of operation

Table 3 Estimated Range of Potential Cancer Health Risks (per million) due to TRUs Operating at a Large Distribution Area Source – 1.0 g/bhp-hr

Total Hours of TRU Engine Operation		Downwind Distance (m) from Center of Area Source											
Per Week	Per Year	100	150	200	250	300	350	400	450	500	600	700	800
100	5,200												
150	7,800												
200	10,400												
250	13,000												
300	15,600												
350	18,200												
400	20,800												
450	23,400												
500	26,000												
600	31,200												
700	36,400												
800	41,600												
900	46,800												
1,000	52,000												
1,100	57,200												
1,200	62,400												
1,300	67,600												
1,400	72,800												
1,500	78,000												

Meteorological Data: West LA (1981)
Emission Parameters: Engine Size - 35 hp, Engine Load Factor - 60%, Area Source.
Grey Shading shows Cancer Risks < 10/million
No Shading shows Cancer Risks ≥ 10/million and < 100/million
Horizontal Line Shading shows Cancer Risks ≥ 100/million
Annual emissions assume 52 weeks of operation

Table 4 Estimated Range of Potential Cancer Health Risks (per million) due to TRUs Operating at a Large Distribution Area Source – 0.3 g/bhp-hr

Total Hours of TRU Engine Operation		Downwind Distance (m) from Center of Area Source											
Per Week	Per Year	100	150	200	250	300	350	400	450	500	600	700	800
100	5,200												
150	7,800												
200	10,400												
250	13,000												
300	15,600												
350	18,200												
400	20,800												
450	23,400												
500	26,000												
600	31,200												
700	36,400												
800	41,600												
900	46,800												
1,000	52,000												
1,100	57,200												
1,200	62,400												
1,300	67,600												
1,400	72,800												
1,500	78,000												

Meteorological Data: West LA (1981)
Emission Parameters: Engine Size - 35 hp, Engine Load Factor - 60%, Area Source.
Grey Shading shows Cancer Risks < 10/million
No Shading shows Cancer Risks ≥ 10/million and < 100/million
Horizontal Line Shading shows Cancer Risks ≥ 100/million
Annual emissions assume 52 weeks of operation

Table 5 Estimated Range of Potential Cancer Health Risks (per million) due to TRUs Operating at a Large Distribution Area Source – 0.22 g/bhp-hr

Total Hours of TRU Engine Operation		Downwind Distance (m) from Center of Area Source											
Per Week	Per Year	100	150	200	250	300	350	400	450	500	600	700	800
100	5,200												
150	7,800												
200	10,400												
250	13,000												
300	15,600												
350	18,200												
400	20,800												
450	23,400												
500	26,000												
600	31,200												
700	36,400												
800	41,600												
900	46,800												
1,000	52,000												
1,100	57,200												
1,200	62,400												
1,300	67,600												
1,400	72,800												
1,500	78,000												

Meteorological Data: West LA (1981)
Emission Parameters: Engine Size - 35 hp, Engine Load Factor - 60%, Area Source.
Grey Shading shows Cancer Risks < 10/million
No Shading shows Cancer Risks ≥ 10/million and < 100/million
Horizontal Line Shading shows Cancer Risks ≥ 100/million
Annual emissions assume 52 weeks of operation

Table 6 Estimated Range of Potential Cancer Health Risks (per million) due to TRUs Operating at a Large Distribution Area Source – 0.02 g/bhp-hr

Total Hours of TRU Engine Operation		Downwind Distance (m) from Center of Area Source											
Per Week	Per Year	100	150	200	250	300	350	400	450	500	600	700	800
100	5,200												
150	7,800												
200	10,400												
250	13,000												
300	15,600												
350	18,200												
400	20,800												
450	23,400												
500	26,000												
600	31,200												
700	36,400												
800	41,600												
900	46,800												
1,000	52,000												
1,100	57,200												
1,200	62,400												
1,300	67,600												
1,400	72,800												
1,500	78,000												

Meteorological Data: West LA (1981)
Emission Parameters: Engine Size - 35 hp, Engine Load Factor - 60%, Area Source.
Grey Shading shows Cancer Risks < 10/million
No Shading shows Cancer Risks ≥ 10/million and < 100/million
Horizontal Line Shading shows Cancer Risks ≥ 100/million
Annual emissions assume 52 weeks of operation

References

OEHHA, 2000. Office of Environmental Health Hazard Assessment (OEHHA), *Air Toxics "Hot Spots" Program Risk Assessment Guidelines Part IV Technical Support Document for Exposure Assessment and Stochastic Analysis.* www.oehha.ca.gov/air/hot_spots/finalStoc.html. September 2000.

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APPENDIX F

DIESEL TRANSPORT REFRIGERATION UNIT ENGINES SENSITIVITY STUDIES FOR DISPERSION MODELING

Initial Plume Height and Buoyancy Flux

Although the sources for the TRU health risk assessment were treated as area sources, it is recognized that the emission plume will have upward buoyancy flux due to the upward velocity of the engine exhaust and the temperature difference between the engine exhaust and the ambient air. To demonstrate this upward buoyancy, ARB staff performed several screening analyses based on: high speed versus low speed of the TRU engine; high exhaust temperature versus low exhaust temperature; night time ambient air temperatures versus day time ambient air temperatures; and unstable versus stable meteorological conditions.

Using SCREEN3, ARB staff charted the effective plume height based on scenarios encompassing the above variables. The largest difference in effective plume height was found when comparing night time and day time effective plume heights. These daytime and night time effective plume heights were used as the initial emission height based on operations occurring during day time hours (7 AM to 7 PM) or night time hours (7 PM to 7 AM). Ambient temperatures used to estimate these effective plume heights were 302 K (84° F) for operations occurring during day time hours and 280 K (44° F) for operations occurring during night time hours. Atmospheric stability was set to emulate conservative day and night time conditions. For these analyses SCREEN3 was modeled using "F" stability for night conditions and "D" stability for day conditions. The resulting effective plume heights, and initial emission heights used for our analyses were a day time initial emission height of 4.46 meters and an initial emission height of 12.79 meters for night time conditions.

The initial vertical dispersion parameter (σ_z) used for this analysis both for day and night time conditions was 2.5 meters. This value was determined using the methods described in the ISCST3 user's guide.

Characterization as an area source and a point source

Sensitivity studies were done to demonstrate that impacts from TRU emissions would show little difference when the source is characterized as area or point. The table below shows a comparison of cancer health impacts due to a TRU engine modeled as an area source and as a point source. The table is only used to illustrate the similarity of modeled impacts as point and area sources particularly.

Difference in Potential Cancer Risk due to Point and Area Source TRUs (Risk per million)

Total TRU Hours of Operation per Week	Downwind Distance (m) from Sources									
	40	60	80	100	120	140	160	180	200	220
7	-24	-10	-5	-3	-1	-1	-1	-1	-1	-1
14	-48	-19	-9	-4	-2	-2	-2	-2	-2	-2
20	-69	-27	-13	-6	-4	-3	-3	-2	-3	-2
30	-103	-40	-19	-9	-6	-4	-4	-4	-3	-3
40	-137	-53	-25	-12	-8	-6	-6	-5	-4	-4
50	-171	-67	-32	-15	-10	-7	-6	-6	-5	-4

Meteorological Data: West Los Angeles (1981)
Emission Rate = 0.7 g/bhp-hr.
Emission Parameters: Engine Size - 35 hp, Load Factor - 60%.
Annual emissions assume 52 weeks of operation, 6 AM - 9 PM

APPENDIX G

SUMMARY OF MISCELLANEOUS METHODOLOGIES FOR COST ANALYSIS

APPENDIX G

SUMMARY OF MISCELLANEOUS METHODOLOGIES FOR COST ANALYSIS

A. Costs to ARB

One-time compliance education and outreach costs are estimated as follows:

	Low	High
In-House Educational Material Design (8 pages, black-and-white):	$1,000	$1,000
Printing Cost for Educational Material— 8 pages x $0.05/page x 4,674 – 10,073 stakeholders:	$1,870	$4,015
Postage— $0.60/piece x 4,674 – 10,073 stakeholders:	$2,804	$6,022
Printing Cost for Educational Material (Trade Show Distribution[1])— 8 pages x $0.05/page x 2,000 pieces:	$ 800	$ 800
Total:	$6,474	$11,837
Total (rounded):	**$6,500**	**$12,000**

The proposed ATCM will impose a cost to the ARB for TRU enforcement, for record management, and for issuing ARB identification numbers to operators or owners of TRUs. Initial costs to the ARB primarily involve developing the TRU database for tracking in-use TRUs and facility operations throughout the state. Additional cost will be incurred from enforcement activities through the ARB's existing Heavy-Duty Vehicle Inspection Program performed at various CHP weigh stations throughout California and at various food distribution or cold storage facilities. The ARB is expected to incur annual costs to implement the TRU ATCM, but anticipates that the costs will be absorbed within existing budgets.

The Executive Officer has also determined that the proposed regulatory action will not create costs or savings in federal funding to the State.

[1] Trade show distribution is assumed to be through existing ARB Enforcement Division trade show participation; may also include distribution of educational materials to TRU and engine manufacturers and dealers as needed.

B. Determination of Number of Affected Businesses, Including the Establishment of a Small Business Definition for the Purposes of This ATCM

The total number of businesses directly affected by this ATCM consists of those businesses visited by and/or operating TRUs within the State of California. The number of affected businesses differs from the TRU inventory discussed in earlier chapters of this report due to the fact that affected businesses may own or operate more than one TRU, or none at all; some businesses are only visited by TRUs and do not operate any.

A relatively small number (less than 100) of affected businesses are involved in direct TRU-related activities, such as the distribution, sale, and servicing of TRUs.

B.1. Number of Businesses Operating TRUs

Direct information on the number of businesses that operate TRUs is not available. TRUs are not subject to any known registration program, and although Department of Motor Vehicles (DMV) registration records do indicate whether a truck or trailer is refrigerated, it is not possible to determine from the records if the vehicle has a TRU that is subject to this regulation.

For the analysis purposes of this ATCM, the following criteria were used to determine if a business may be classified as meeting the small business definition:

Table G-1
Summary of Small Business Determination Criteria

Business Type	Small Business Criteria	Estimated Percentage of Affected Businesses Meeting Sm. Bus. Criteria
Facility Visited by TRUs	Has Fewer Than 20 Employees	81
TRU Operator	Has 20 or Fewer TRUs	66

Meeting the small business criteria does not relieve business owners of any obligations under this ATCM. The small business criteria were used for analysis purposes and establishment of the facility reporting requirement threshold.

Typical businesses are considered the remainder of the affected business population; 19 percent of facilities, 34 percent of TRU operators.

B.1.1. Number of TRU Operators

The number of operators was estimated by examination of the California Highway Patrol (CHP) Biennial Inspection of Terminals (BIT) list and an insurance industry-based list (FleetSeek) of vehicle operators. The examination eliminated from the lists those

businesses whose names obviously indicated that they were unlikely to have TRUs; for example, concrete sales and construction businesses. From these lists, the estimated number of California vehicle operators possibly having TRUs is 1,477 to 5,500. It is estimated that 25% of the total TRUs in California are from out of state; we apply this percentage to estimate the number of out-of-state businesses operating TRUs in California:

Lower Limit of Estimated Range (California operators) x 0.33 = Estimated Out-of-State Operators
(33% of smaller number equals 25% of total)

1,477 x 0.33 = 492

Performing the same calculation on the upper limit of the estimated range (California operators) gives 1,832 out-of-state operators. (ARB, 2003)

To summarize:

Table G-2
Estimated Number of TRU Operators

	Low	High
California	1,477	5,500
Out-of-State	492	1,832
Total	1,969	7,332
Total (rounded)	2,000	7,300

B.1.2. Number of Facilities Where TRUs Operate

Direct information on the number of California facilities where TRUs operate is not available. The facility requirement of this regulation only applies to facilities located in California. Since most facilities where TRUs operate are subject to state or federal licensing programs, lists of the licensees in the programs that were likely to involve TRUs (wholesale food distribution, dairy products, etc.) were obtained and the number of facilities was tabulated. It is recognized that some facilities may appear on more than one list, due to overlapping licensing requirements and/or business conditions that may require more than one license. This possible duplication will tend to overstate the actual number of facilities; however, the extent of this effect is minor, and may be partially or totally offset by businesses that may not appear on the lists. (DFA, 2002) (DHS,2003) (USDA, 2003)

Table G-3
Facility Count From Licensing Program Lists

Name of Licensing Program	Number of Facilities	Affected Facilities
CA Dept of Health Services—Wholesale Food Facilities	6,413	2,164
CA Dept. of Food & Agriculture—Meat & Poultry	620	209
CA Dept. of Food & Agriculture—Milk Plants	50	17
CA Dept. of Food & Agriculture—Egg Handlers	350	118
US Dept. of Agriculture—HACCP Large Facility	12	4
US Dept. of Agriculture—HACCP Small Facility	294	99
US Dept. of Agriculture—HACCP Very Small Facility	278	94
Total	8,017	2,705

This is the estimated number of California facilities where TRUs operate; however, not all facilities will experience costs associated with the reporting requirement of this regulation. Only facilities meeting certain criteria must report. Due to a lack of data, complete adjustments to the total number of facilities to determine the actual number of facilities that must complete and submit a facility report are not possible. However, for a subset of the DHS licensee list, data on the number of employees per facility are available. This is one of the criteria for determining if a facility must submit a report. Using these data, a percentage of facilities with 20 or more employees was determined, and this percentage was applied to the facility total to provide some adjustment to refine the total number of facilities that must submit a report.

Number of Facilities With 20 or More Employees / Total Number of Facilities Reporting Number of Employees Information = Ratio of Facilities With 20 or More Employees

635/1882 = 0.3374 ~ 33.74%

Total Number of Facilities x Ratio of Facilities With 20 or More Employees = Adjusted Total Number of Facilities (itemization is shown in the table above)

8,017 x 0.3374 = 2,705 ~ 2,700 (rounded)

Since data were not available to adjust the total for the other criteria triggering a facility report, the number calculated above is considered the upper bound of the estimated number of facilities that are required to report. This is a conservative estimate, as it assumes that all facilities with 20 or more employees will have to provide a facility report, when it is known that an undetermined number of facilities will be exempted due to other provisions in the regulation. To provide a conservative lower bound, the same number was used for the lower bound. This was done to account for facilities that may not appear in any of the consulted licensee lists.

Adding the number of operators and facilities gives the total number of businesses affected:

Table G-4
Total Number of Affected Businesses

Category	Low	High
Number of Operators	1,969	7,332
Number of Facilities (20 or more employees)	2,705	2,705
Total	4,674	10,037
Total (rounded)	4,700	10,000

B.2 Number of Small Businesses Affected by the Regulation

The determination as to whether a given business can be considered small is typically performed by examining one or more indicators of the business' activity level (revenue, number of employees, etc.) and comparing the indicator(s) against the limits contained in the small business definition. Small business definitions can vary by type of industry and from organization to organization making the definition. Typically, small business definitions are established with a specific objective in mind, such as eligibility for financial assistance or preferential treatment in awarding purchase orders. Based upon the analysis below, small businesses (for the purpose of this analysis) are considered those operating 20 or fewer TRUs; facilities with fewer than 20 employees are also considered small businesses.

B.2.1. Operators (Small Business)

Both California Highway Patrol (CHP) and insurance industry data (FleetSeek) were examined for indicators that could be used to determine appropriate criteria for assessing whether a business could be considered small. Although revenue information is available, it is incomplete and therefore was considered unsuitable for analysis purposes. Other common business activity indicators, such as the number of employees, business physical size, etc., were not readily available for the data set.

Complete information was available on the number of vehicles per business, and though detailed information on the number of vehicles with TRUs for a given business was not available, it is assumed that the number of vehicles per business is an indicator of the volume of business activity of a company. It was also assumed that the number of vehicles was equal to the number of TRUs operated by a business.

Given the range of vehicle fleet sizes (one to over 100 per business), and the assumption that businesses with one to five vehicles could safely be considered small businesses, a chart of the frequency distribution of the number of vehicles (Estimated Fleet Size of Motor Carriers with (or Likely to Have) TRUs) (Chart 2 in this Appendix) was examined for a natural break point in the distribution. Starting from the smallest fleet size (one to five vehicles) and working towards the largest, the number of businesses (carriers) drops quickly, not rising again until the 21 to 25 vehicle point. At this break point in the distribution, 1,084 fleets have 20 or fewer vehicles and are assumed to be small businesses. This is based on examination of a data set consisting

of information for 1,338 fleets. Dividing the total number of operators (total number of businesses analyzed) by the number of small businesses gives a ratio that can be applied to the operator numbers calculated above to give the number of small businesses.

Number of Small Businesses / Total Number of Businesses Analyzed = Ratio of Small Businesses (operators)

1,084 / 1,338 = 0.8102

Applying this ratio to the operator estimates above gives the following range:

Table G-5
Number of Small Businesses (operators)

	Low	High
California	1,197	4,456
Out-of-State	399	1,484
Total	1,596	5,940
Total (rounded)	1,600	6,000

B.2.2 Facilities (Small Business)

The number of employees per facility was the indicator examined to determine appropriate criteria for assessing whether a business could be considered small. Other common business activity indicators, such as annual revenue, business physical size, etc., were not readily available. Number of employees per facility data were available for 1,882 facilities. Examination of a chart of the frequency distribution of the number of employees per facility (Number of Employees per Facility 6 (2/bin)) (Chart 1 in this Appendix) shows that there is a drop in the frequency distribution at the 20 employee point, with a rise in the number of facilities with less than or greater than this quantity. At this break point in the distribution, 1,247 facilities have fewer than 20 employees and are assumed to be small businesses. Using the quantity of facilities with fewer than 20 employees and the total number of facilities for which employee quantity data are available, a ratio can be calculated:

Quantity of Facilities With Fewer Than 20 Employees / Total Number of Facilities With Available Data = Ratio of Small Businesses (facilities)

1,247/1882 = 0.6625

Applying this ratio to the estimated number of facilities from above gives the following number:

8,017 x 0.6625 = 5,311

This is the number of facilities that would be considered small businesses and would not be included in the facility reporting requirements outlined in the ATCM. Therefore, these businesses would not incur any costs associated with facility reporting.

The only small businesses affected by the ATCM would be those operating TRUs. Since none of the facilities classified as a small business under the criteria given above are affected by the facility provisions of this ATCM, their contribution to the total number of affected small businesses is zero.

Table G-6
Number of Small Businesses Affected by the Regulation (total)

	Low	High
California	1,197	4,456
Out-of-State	399	1,484
Total	1,596	5,940
Total (rounded)	1,600	6,000

ATCM Annual Total Cost Apportionment Between Facilities and TRU Operators

To place the ATCM costs in perspective, the costs attributed to both facilities and operators are expressed below as percentages.

The range of annual (for a 13-year period) operator and facility costs are itemized as follows:

	Low	High
Operators—		
In-Use:	$4,175,634	$8,113,805
Reporting:	$78,760	$2,346,240
Sub-Total:	$4,254,394	$10,460,045
Percentage of Total:	96	67
Facilities—		
Reporting (annualized):	$198,200	$5,145,153
Sub-Total:	$198,200	$5,145,153
Percentage of Total:	4	33
Total	$4,452,594	$15,605,198
Total (rounded):	$4,500,000	$16,000,000

C. Cost Analysis Matrices and Charts

Matrix 1

Used to calculate the in-use compliance cost for the low and high ends of the cost range for VDECS Scenario (assumed 100% application of the listed technologies to the in-use fleet at time of compliance) and the two alternatives, Electric Standby Retrofit (Alternative #1) and Cryogenic Technology (Alternative #2). As for the VDECS Scenario, 100% application of the listed technology to the eligible in-use fleet is assumed.)

For each scenario, the TRU engine population for each category is multiplied by the costs for the assumed compliance technology. Costs used are initial and annual, with the initial cost (cost of compliance equipment and installation labor) spread out over an assumed ten-year useful life, taking into account the time value of money. The annual cost includes recurring costs attributable to the compliance technology, over and above those currently experienced by a TRU operator for diesel use. The costs per engine category are then summed for a given year to arrive at an annual cost, for that year.

Matrix 1a

This matrix is used to calculate the in-use compliance cost for the engine/TRU replacement scenario. Instead of VDECS in-use compliance costs, this matrix uses engine and TRU replacement costs for the calculations. It uses the same methodology as Matrix #1, but apportions an assumed fifteen percent for new TRUs and forty percent for engine replacement to calculate the in-use compliance cost for this scenario.

Matrix 2

For the VDECS scenario, this matrix is used to calculate the ATCM's annual and total costs, as well as its cost effectiveness.

Matrix 2a

For the engine/TRU replacement scenario, this matrix is used to calculate the annual and total costs, as well as the cost effectiveness.

Matrix 3

This matrix is used to calculate the cost effectiveness, as well as the annual and total costs of Alternative #1.

Matrix 4

This matrix is used to calculate the cost effectiveness, as well as the annual and total costs of Alternative #2.

Chart 1

Used to examine the distribution of the number of employees per facility and select a threshold for a small business definition for facilities visited by TRUs.

Chart 2

This chart shows the distribution of fleet sizes for motor carriers with (or likely to have) TRUs. Used to help select a small business threshold for TRU operators.

References

ARB, 2003. Air Resources Board. Preliminary Draft Summary—California Motor Carriers With (or Likely to Have) TRUs. June 6, 2003

DFA, 2002. California Department of Food and Agriculture, California Department of Food and Agriculture Confidential Databases for Meat and Poultry - April 2002 Floppy Disk, Milk Plants - January 2002, and Egg Handlers - August 2002.

DHS, 2003. California Department of Health Services, California Department of Health Services Database for Wholesale Food Facilities, February 2003.

USDA, 2003. U.S. Department of Agriculture Databases for Hazard Analysis Critical Control Program (HACCP) Large and Small Facilities. Floppy Diskette. June 2003.

In-Use Compliance Range Estimates

Oct. 12, 03

This Matrix calculates the in-use cost of compliance for TRUs and TRU gen sets ("TRUs".) It takes the annual TRU population numbers (same as used for emissions inventory purposes) and multiplies them by the capital and annual costs for the compliance technology shown.
The capital costs are amortized over an assumed ten-year useful life, and all annual costs are converted to constant year (2002) dollars using standard present worth analysis techniques.
Four different scenarios are shown, the first two are the low and high cost ends of the range of expected in-use compliance costs, and the last two are the alternative technologies examined for the economic impact statement in the Form 399.
In each scenario, on a year-by-year basis, population figures for each engine category are multiplied by a compliance cost component (annualized capital or annual maintenance); these products are then summed to determine the compliance cost for a given year.

Interest Rates Used for Present Worth Analysis

Capital Costs:	0.05	Real interest rate, which is a 7% nominal rate minus an assumed 2% inflation rate
Annual Costs:	0.05	Real interest rate, which is a 7% nominal rate minus an assumed 2% inflation rate

Assumptions: 10-year useful life for compliance technology, capital cost is amortized over a 10-year period.

Low-Cost Scenario: Assume 1200 Hours/Year TRU/Gen Set Operation

In-Use Compliance Technology Used

	Cap. Cost	Ann. Cost - TRUs	Ann. Cost - Gen Sets	Notes
LETRU: FBC + CWMF	$2,050	$107	$97	FBC = Fuel-Borne Catalyst, CWMF = Catalyzed Wire Mesh Filter
ULETRU: LPG Dual-Fuel Pilot Injection	$2,300	$0	$0	

Engine Population Category / Capital Cost Subtotal

Engine Model Year	Calendar Year	< 15hp	15-25 hp	25-50 hp CA-based	25-50 hp Out-of-State	25-50 hp Gen Sets CA-based	25-50 hp Gen Sets Out-of-State	25-50 hp Reefer Railcar	Total 25-50 hp (Info Only)	Total (this year)	Annualized Capital Cost[1]	< 15hp											15-25 hp									
-2001	2008	2125	880	11162	3721	656	285	822	16646	19651	$265	$564,134											$233,616									
2002	2009	311	124	1419	473	156	52	105	2205	2640	$265	$564,134	$82,563										$233,616	$32,919								
2003	2010	328	128	1493	498	172	57	110	2330	2764	$298	$564,134	$82,563	$97,099									$233,616	$32,919	$38,125							
2004	2011	340	132	1571	524	189	63	116	2463	2935	$298	$564,134	$82,563	$97,099	$101,269								$233,616	$32,919	$38,125	$39,316						
2005	2012	356	136	1652	551	209	70	122	2604	3096	$298	$564,134	$82,563	$97,099	$101,269	$106,035							$233,616	$32,919	$38,125	$39,316	$40,508					
2006	2013	372	140	1738	579	230	77	128	2752	3264	$298	$564,134	$82,563	$97,099	$101,269	$106,035	$110,800						$233,616	$32,919	$38,125	$39,316	$40,508	$41,699				
2007	2014	389	144	1829	610	254	85	135	2913	3446	$298	$564,134	$82,563	$97,099	$101,269	$106,035	$110,800	$115,564					$233,616	$32,919	$38,125	$39,316	$40,508	$41,699	$42,890				
2008	2015	407	148	1924	641	279	93	142	3079	3634	$298	$564,134	$82,563	$97,099	$101,269	$106,035	$110,800	$115,564	$121,225				$233,616	$32,919	$38,125	$39,316	$40,508	$41,699	$42,890	$44,082			
2009	2016	426	153	2024	675	308	103	149	3259	3838	$298	$564,134	$82,563	$97,099	$101,269	$106,035	$110,800	$115,564	$121,225	$126,884			$233,616	$32,919	$38,125	$39,316	$40,508	$41,699	$42,890	$44,082	$45,571		
2010	2017	445	157	2129	710	339	113	157	3448	4050	$298	$564,134	$82,563	$97,099	$101,269	$106,035	$110,800	$115,564	$121,225	$126,884	$132,543		$233,616	$32,919	$38,125	$39,316	$40,508	$41,699	$42,890	$44,082	$45,571	$46,762	
2011	2018	465	162	2240	747	374	125	165	3651	4278	$298		$82,563	$97,099	$101,269	$106,035	$110,800	$115,564	$121,225	$126,884	$132,543	$138,500		$32,919	$38,125	$39,316	$40,508	$41,699	$42,890	$44,082	$45,571	$46,762	$48,252
2012	2019	486	167	2356	785	412	137	174	3864	4517	$298			$97,099	$101,269	$106,035	$110,800	$115,564	$121,225	$126,884	$132,543	$138,500	$144,755			$38,125	$39,316	$40,508	$41,699	$42,890	$44,082	$45,571	$46,762	$48,252
2013	2020	509	172	*	*	*	*	*	*	681	$298				$101,269	$106,035	$110,800	$115,564	$121,225	$126,884	$132,543	$138,500	$144,755	$151,606			$39,316	$40,508	$41,699	$42,890	$44,082	$45,571	$46,762	$48,252
	2021	*	*	*	*	*	*	*	*	*						$106,035	$110,800	$115,564	$121,225	$126,884	$132,543	$138,500	$144,755	$151,606				$40,508	$41,699	$42,890	$44,082	$45,571	$46,762	$48,252
	2022	*	*	*	*	*	*	*	*	*							$110,800	$115,564	$121,225	$126,884	$132,543	$138,500	$144,755	$151,606					$41,699	$42,890	$44,082	$45,571	$46,762	$48,252
	2023	*	*	*	*	*	*	*	*	*								$115,564	$121,225	$126,884	$132,543	$138,500	$144,755	$151,606						$42,890	$44,082	$45,571	$46,762	$48,252
	2024	*	*	*	*	*	*	*	*	*									$121,225	$126,884	$132,543	$138,500	$144,755	$151,606							$44,082	$45,571	$46,762	$48,252
	2025	*	*	*	*	*	*	*	*	*										$126,884	$132,543	$138,500	$144,755	$151,606								$45,571	$46,762	$48,252
	2026	*	*	*	*	*	*	*	*	*											$132,543	$138,500	$144,755	$151,606									$46,762	$48,252
	2027	*	*	*	*	*	*	*	*	*												$138,500	$144,755	$151,606										$48,252
	2028	*	*	*	*	*	*	*	*	*													$144,755	$151,606										
	2029	*	*	*	*	*	*	*	*	*														$151,606										
										59014	Total																						

[1] In-Use Affected Population = 0; Assumes Full Introduction of EPA Tier 4 Engines into TRU/Gen Set Fleet
[1] This is the annualized capital cost of the appropriate in-use compliance technology used to meet LETRU or ULETRU requirements as appropriate. The interest rate used is given at the top of this matrix.
[2] This is the annual cost of maintaining the in-use compliance technology over and above that for diesel technology. It may include items such as more-frequent engine servicing, cost of fuel-borne catalyst or other additive, and/or servicing of emission-control device(s).

High-Cost Scenario: Assume 3,000 Hours/Year TRU/Gen Set Operation

In-Use Compliance Technology Used

	Cap. Cost	Ann. Cost - TRUs	Ann. Cost - Gen Sets	Notes
LETRU: FBC + CWMF	$2,050	$291	$97	FBC = Fuel-Borne Catalyst, CWMF = Catalyzed Wire Mesh Filter
ULETRU: LPG Dual-Fuel Pilot Injection	$2,300	$0	$0	

Engine Population Category / Capital Cost Subtotal

Engine Model Year	Calendar Year	< 15hp	15-25 hp	25-50 hp CA-based	25-50 hp Out-of-State	25-50 hp Gen Sets CA-based	25-50 hp Gen Sets Out-of-State	25-50 hp Reefer Railcar	Total 25-50 hp (Info Only)	Total (this year)	Annualized Capital Cost[1]	< 15hp											15-25 hp									
-2001	2008	2125	880	11162	3721	656	285	822	16646	19651	$265	$564,134											$233,616									
2002	2009	311	124	1419	473	156	52	105	2205	2640	$265	$564,134	$82,563										$233,616	$32,919								
2003	2010	328	128	1493	498	172	57	110	2330	2764	$298	$564,134	$82,563	$97,099									$233,616	$32,919	$38,125							
2004	2011	340	132	1571	524	189	63	116	2463	2935	$298	$564,134	$82,563	$97,099	$101,269								$233,616	$32,919	$38,125	$39,316						
2005	2012	356	136	1652	551	209	70	122	2604	3096	$298	$564,134	$82,563	$97,099	$101,269	$106,035							$233,616	$32,919	$38,125	$39,316	$40,508					
2006	2013	372	140	1738	579	230	77	128	2752	3264	$298	$564,134	$82,563	$97,099	$101,269	$106,035	$110,800						$233,616	$32,919	$38,125	$39,316	$40,508	$41,699				
2007	2014	389	144	1829	610	254	85	135	2913	3446	$298	$564,134	$82,563	$97,099	$101,269	$106,035	$110,800	$115,564					$233,616	$32,919	$38,125	$39,316	$40,508	$41,699	$42,890				
2008	2015	407	148	1924	641	279	93	142	3079	3634	$298	$564,134	$82,563	$97,099	$101,269	$106,035	$110,800	$115,564	$121,225				$233,616	$32,919	$38,125	$39,316	$40,508	$41,699	$42,890	$44,082			
2009	2016	426	153	2024	675	308	103	149	3259	3838	$298	$564,134	$82,563	$97,099	$101,269	$106,035	$110,800	$115,564	$121,225	$126,884			$233,616	$32,919	$38,125	$39,316	$40,508	$41,699	$42,890	$44,082	$45,571		
2010	2017	445	157	2129	710	339	113	157	3448	4050	$298	$564,134	$82,563	$97,099	$101,269	$106,035	$110,800	$115,564	$121,225	$126,884	$132,543		$233,616	$32,919	$38,125	$39,316	$40,508	$41,699	$42,890	$44,082	$45,571	$46,762	
2011	2018	465	162	2240	747	374	125	165	3651	4278	$298		$82,563	$97,099	$101,269	$106,035	$110,800	$115,564	$121,225	$126,884	$132,543	$138,500		$32,919	$38,125	$39,316	$40,508	$41,699	$42,890	$44,082	$45,571	$46,762	$48,252
2012	2019	486	167	2356	785	412	137	174	3864	4517	$298			$97,099	$101,269	$106,035	$110,800	$115,564	$121,225	$126,884	$132,543	$138,500	$144,755			$38,125	$39,316	$40,508	$41,699	$42,890	$44,082	$45,571	$46,762	$48,252
2013	2020	509	172	*	*	*	*	*	*	681	$298				$101,269	$106,035	$110,800	$115,564	$121,225	$126,884	$132,543	$138,500	$144,755	$151,606			$39,316	$40,508	$41,699	$42,890	$44,082	$45,571	$46,762	$48,252
	2021	*	*	*	*	*	*	*	*	*						$106,035	$110,800	$115,564	$121,225	$126,884	$132,543	$138,500	$144,755	$151,606				$40,508	$41,699	$42,890	$44,082	$45,571	$46,762	$48,252
	2022	*	*	*	*	*	*	*	*	*							$110,800	$115,564	$121,225	$126,884	$132,543	$138,500	$144,755	$151,606					$41,699	$42,890	$44,082	$45,571	$46,762	$48,252
	2023	*	*	*	*	*	*	*	*	*								$115,564	$121,225	$126,884	$132,543	$138,500	$144,755	$151,606						$42,890	$44,082	$45,571	$46,762	$48,252
	2024	*	*	*	*	*	*	*	*	*									$121,225	$126,884	$132,543	$138,500	$144,755	$151,606							$44,082	$45,571	$46,762	$48,252
	2025	*	*	*	*	*	*	*	*	*										$126,884	$132,543	$138,500	$144,755	$151,606								$45,571	$46,762	$48,252
	2026	*	*	*	*	*	*	*	*	*											$132,543	$138,500	$144,755	$151,606									$46,762	$48,252
	2027	*	*	*	*	*	*	*	*	*												$138,500	$144,755	$151,606										$48,252
	2028	*	*	*	*	*	*	*	*	*													$144,755	$151,606										
	2029	*	*	*	*	*	*	*	*	*														$151,606										
										59014	Total																						

[1] In-Use Affected Population = 0; Assumes Full Introduction of EPA Tier 4 Engines into TRU/Gen Set Fleet
[1] This is the annualized capital cost of the appropriate in-use compliance technology used to meet LETRU or ULETRU requirements as appropriate. The interest rate used is given at the top of this matrix.
[2] This is the annual cost of maintaining the in-use compliance technology over and above that for diesel technology. It may include items such as more-frequent engine servicing, cost of fuel-borne catalyst or other additive, and/or servicing of emission-control device(s).

Matrix #1

Alternative 1 Scenario: Use of Electric Standby Retrofit-- Assume 1,200 Hours/Year TRU/Gen Set Operation[3]

In-Use Compliance Technology Used

	Cap. Cost	Ann. Cost - TRUs	Ann. Cost - Gen Sets	Notes
LETRU: Electric Standby Retrofit	$15,600	$519		
ULETRU: Electric Standby Retrofit	$15,600	$519		

Engine Population Category

Engine Model Year	Calendar Year	< 15hp	15-25 hp	25-50 hp CA-based	25-50 hp Out-of-State	25-50 hp Gen Sets CA-based	25-50 hp Gen Sets Out-of-State	25-50 hp Reefer Railcar	Total 25-50 hp (Info Only)	Total (this year)	Annualized Capital Cost[1]
-2001	2008	2125	880	11162	3721	856	285	822	16846	19851	$2,020
2002	2009	311	124	1419	473	156	52	105	2205	2640	$2,020
2003	2010	326	128	1493	498	172	57	110	2330	2784	$2,020
2004	2011	340	132	1571	524	189	63	116	2463	2935	$2,020
2005	2012	356	136	1652	551	209	70	122	2604	3096	$2,020
2006	2013	372	140	1738	579	230	77	128	2752	3264	$2,020
2007	2014	389	144	1829	610	254	85	135	2913	3446	$2,020
2008	2015	407	148	1924	641	279	93	142	3079	3634	$2,020
2009	2016	426	153	2024	675	308	103	149	3259	3838	$2,020
2010	2017	445	157	2129	710	339	113	157	3448	4050	$2,020
2011	2018	465	162	2240	747	374	125	165	3651	4276	$2,020
2012	2019	486	167	2356	785	412	137	174	3864	4517	$2,020
2013	2020	509	172	*	*	*	*	*	*	681	$2,020
	2021	*	*	*	*	*	*	*	*	*	
	2022	*	*	*	*	*	*	*	*	*	
	2023	*	*	*	*	*	*	*	*	*	
	2024	*	*	*	*	*	*	*	*	*	
	2025	*	*	*	*	*	*	*	*	*	
	2026	*	*	*	*	*	*	*	*	*	
	2027	*	*	*	*	*	*	*	*	*	
	2028	*	*	*	*	*	*	*	*	*	
	2029	*	*	*	*	*	*	*	*	*	
										59014	Total

Capital Cost Subtotal

Calendar Year	< 15hp											
2008	$4,292,925											
2009	$4,292,925	$628,282										
2010	$4,292,925	$628,282	$658,565									
2011	$4,292,925	$628,282	$658,565	$686,868								
2012	$4,292,925	$628,282	$658,565	$686,868	$719,191							
2013	$4,292,925	$628,282	$658,565	$686,868	$719,191	$751,514						
2014	$4,292,925	$628,282	$658,565	$686,868	$719,191	$751,514	$785,858					
2015	$4,292,925	$628,282	$658,565	$686,868	$719,191	$751,514	$785,858	$822,221				
2016	$4,292,925	$628,282	$658,565	$686,868	$719,191	$751,514	$785,858	$822,221	$860,605			
2017	$4,292,925	$628,282	$658,565	$686,868	$719,191	$751,514	$785,858	$822,221	$860,605	$898,989		
2018		$628,282	$658,565	$686,868	$719,191	$751,514	$785,858	$822,221	$860,605	$898,989	$939,393	
2019			$658,565	$686,868	$719,191	$751,514	$785,858	$822,221	$860,605	$898,989	$939,393	$981,817
2020				$686,868	$719,191	$751,514	$785,858	$822,221	$860,605	$898,989	$939,393	$981,817
2021					$719,191	$751,514	$785,858	$822,221	$860,605	$898,989	$939,393	$981,817
2022						$751,514	$785,858	$822,221	$860,605	$898,989	$939,393	$981,817
2023							$785,858	$822,221	$860,605	$898,989	$939,393	$981,817
2024								$822,221	$860,605	$898,989	$939,393	$981,817
2025									$860,605	$898,989	$939,393	$981,817
2026										$898,989	$939,393	$981,817
2027											$939,393	$981,817
2028												$981,817
2029												

Calendar Year	(cont.)
2008	
2009	
2010	
2011	
2012	
2013	
2014	
2015	
2016	
2017	
2018	
2019	
2020	$1,028,282
2021	$1,028,282
2022	$1,028,282
2023	$1,028,282
2024	$1,028,282
2025	$1,028,282
2026	$1,028,282
2027	$1,028,282
2028	$1,028,282
2029	$1,028,282

Capital Cost Subtotal

Calendar Year	15-25 hp										
2008	$1,777,776										
2009	$1,777,776	$250,505									
2010	$1,777,776	$250,505	$258,586								
2011	$1,777,776	$250,505	$258,586	$266,666							
2012	$1,777,776	$250,505	$258,586	$266,666	$274,747						
2013	$1,777,776	$250,505	$258,586	$266,666	$274,747	$282,828					
2014	$1,777,776	$250,505	$258,586	$266,666	$274,747	$282,828	$290,909				
2015	$1,777,776	$250,505	$258,586	$266,666	$274,747	$282,828	$290,909	$298,990			
2016	$1,777,776	$250,505	$258,586	$266,666	$274,747	$282,828	$290,909	$298,990	$309,091		
2017	$1,777,776	$250,505	$258,586	$266,666	$274,747	$282,828	$290,909	$298,990	$309,091	$317,171	
2018		$250,505	$258,586	$266,666	$274,747	$282,828	$290,909	$298,990	$309,091	$317,171	$327,272
2019			$258,586	$266,666	$274,747	$282,828	$290,909	$298,990	$309,091	$317,171	$327,272
2020				$266,666	$274,747	$282,828	$290,909	$298,990	$309,091	$317,171	$327,272
2021					$274,747	$282,828	$290,909	$298,990	$309,091	$317,171	$327,272
2022						$282,828	$290,909	$298,990	$309,091	$317,171	$327,272
2023							$290,909	$298,990	$309,091	$317,171	$327,272
2024								$298,990	$309,091	$317,171	$327,272
2025									$309,091	$317,171	$327,272
2026										$317,171	$327,272
2027											$327,272
2028											
2029											

[0] In-Use Affected Population = 0; Assumes Full Introduction of EPA Tier 4 Engines into TRU/Gen Set Fleet

[1] This is the annualized capital cost of the appropriate in-use compliance technology used to meet LETRU or ULETRU requirements as appropriate. The interest rate used is given at the top of this matrix.

[2] This is the annual cost of maintaining the in-use complaince technology over and above that for diesel technology. It may include items such as more-frequent engine servicing, cost of fuel-borne catalyst or other additive, and/or servicing of emission-control device(s).

[3] Use of electric standby retrofit technology not appropriate for gen sets-- cost figures do not include gen sets.

Alternative 2 Scenario: Use of Cryogenic Technology-- Assume 1,200 Hours/Year TRU Operation[4]

In-Use Compliance Technology Used

	Cap. Cost	Ann. Cost - TRUs	Ann. Cost - Gen Sets	Notes
LETRU: Full Cryogenic Refrig	$22,007	$6,133		
ULETRU: Full Cryogenic Refrig	$22,007	$6,133		

Engine Population Category

Engine Model Year	Calendar Year	< 15hp	15-25 hp	25-50 hp CA-based	25-50 hp Out-of-State	25-50 hp Gen Sets CA-based	25-50 hp Gen Sets Out-of-State	25-50 hp Reefer Railcar	Total 25-50 hp (Info Only)	Total (this year)	Annualized Capital Cost[1]
-2001	2008	2125	880	11162	3721	856	285	822	16846	19851	$2,850
2002	2009	311	124	1419	473	156	52	105	2205	2640	$2,850
2003	2010	326	128	1493	498	172	57	110	2330	2784	$2,850
2004	2011	340	132	1571	524	189	63	116	2463	2935	$2,850
2005	2012	356	136	1652	551	209	70	122	2604	3096	$2,850
2006	2013	372	140	1738	579	230	77	128	2752	3264	$2,850
2007	2014	389	144	1829	610	254	85	135	2913	3446	$2,850
2008	2015	407	148	1924	641	279	93	142	3079	3634	$2,850
2009	2016	426	153	2024	675	308	103	149	3259	3838	$2,850
2010	2017	445	157	2129	710	339	113	157	3448	4050	$2,850
2011	2018	465	162	2240	747	374	125	165	3651	4276	$2,850
2012	2019	486	167	2356	785	412	137	174	3864	4517	$2,850
2013	2020	509	172	*	*	*	*	*	*	681	$2,850
	2021	*	*	*	*	*	*	*	*	*	
	2022	*	*	*	*	*	*	*	*	*	
	2023	*	*	*	*	*	*	*	*	*	
	2024	*	*	*	*	*	*	*	*	*	
	2025	*	*	*	*	*	*	*	*	*	
	2026	*	*	*	*	*	*	*	*	*	
	2027	*	*	*	*	*	*	*	*	*	
	2028	*	*	*	*	*	*	*	*	*	
	2029	*	*	*	*	*	*	*	*	*	
										59014	Total

Capital Cost Subtotal

Calendar Year	< 15hp											
2008	$6,056,051											
2009	$6,056,051	$888,321										
2010	$6,056,051	$888,321	$929,070									
2011	$6,056,051	$888,321	$929,070	$968,968								
2012	$6,056,051	$888,321	$929,070	$968,968	$1,014,567							
2013	$6,056,051	$888,321	$929,070	$968,968	$1,014,567	$1,060,165						
2014	$6,056,051	$888,321	$929,070	$968,968	$1,014,567	$1,060,165	$1,108,614					
2015	$6,056,051	$888,321	$929,070	$968,968	$1,014,567	$1,060,165	$1,108,614	$1,159,912				
2016	$6,056,051	$888,321	$929,070	$968,968	$1,014,567	$1,060,165	$1,108,614	$1,159,912	$1,214,060			
2017	$6,056,051	$888,321	$929,070	$968,968	$1,014,567	$1,060,165	$1,108,614	$1,159,912	$1,214,060	$1,268,208		
2018		$888,321	$929,070	$968,968	$1,014,567	$1,060,165	$1,108,614	$1,159,912	$1,214,060	$1,268,208	$1,325,207	
2019			$929,070	$968,968	$1,014,567	$1,060,165	$1,108,614	$1,159,912	$1,214,060	$1,268,208	$1,325,207	$1,385,055
2020				$968,968	$1,014,567	$1,060,165	$1,108,614	$1,159,912	$1,214,060	$1,268,208	$1,325,207	$1,385,055
2021					$1,014,567	$1,060,165	$1,108,614	$1,159,912	$1,214,060	$1,268,208	$1,325,207	$1,385,055
2022						$1,060,165	$1,108,614	$1,159,912	$1,214,060	$1,268,208	$1,325,207	$1,385,055
2023							$1,108,614	$1,159,912	$1,214,060	$1,268,208	$1,325,207	$1,385,055
2024								$1,159,912	$1,214,060	$1,268,208	$1,325,207	$1,385,055
2025									$1,214,060	$1,268,208	$1,325,207	$1,385,055
2026										$1,268,208	$1,325,207	$1,385,055
2027											$1,325,207	$1,385,055
2028												$1,385,055
2029												

Calendar Year	(cont.)
2008	
2009	
2010	
2011	
2012	
2013	
2014	
2015	
2016	
2017	
2018	
2019	
2020	$1,450,602
2021	$1,450,602
2022	$1,450,602
2023	$1,450,602
2024	$1,450,602
2025	$1,450,602
2026	$1,450,602
2027	$1,450,602
2028	$1,450,602
2029	$1,450,602

Capital Cost Subtotal

Calendar Year	15-25 hp										
2008	$2,507,918										
2009	$2,507,918	$353,388									
2010	$2,507,918	$353,388	$364,788								
2011	$2,507,918	$353,388	$364,788	$376,188							
2012	$2,507,918	$353,388	$364,788	$376,188	$387,587						
2013	$2,507,918	$353,388	$364,788	$376,188	$387,587	$398,987					
2014	$2,507,918	$353,388	$364,788	$376,188	$387,587	$398,987	$410,387				
2015	$2,507,918	$353,388	$364,788	$376,188	$387,587	$398,987	$410,387	$421,786			
2016	$2,507,918	$353,388	$364,788	$376,188	$387,587	$398,987	$410,387	$421,786	$436,036		
2017	$2,507,918	$353,388	$364,788	$376,188	$387,587	$398,987	$410,387	$421,786	$436,036	$447,435	
2018		$353,388	$364,788	$376,188	$387,587	$398,987	$410,387	$421,786	$436,036	$447,435	$461,685
2019			$364,788	$376,188	$387,587	$398,987	$410,387	$421,786	$436,036	$447,435	$461,685
2020				$376,188	$387,587	$398,987	$410,387	$421,786	$436,036	$447,435	$461,685
2021					$387,587	$398,987	$410,387	$421,786	$436,036	$447,435	$461,685
2022						$398,987	$410,387	$421,786	$436,036	$447,435	$461,685
2023							$410,387	$421,786	$436,036	$447,435	$461,685
2024								$421,786	$436,036	$447,435	$461,685
2025									$436,036	$447,435	$461,685
2026										$447,435	$461,685
2027											$461,685
2028											
2029											

[0] In-Use Affected Population = 0; Assumes Full Introduction of EPA Tier 4 Engines into TRU/Gen Set Fleet

[1] This is the annualized capital cost of the appropriate in-use compliance technology used to meet LETRU or ULETRU requirements as appropriate. The interest rate used is given at the top of this matrix.

[2] This is the annual cost of maintaining the in-use complaince technology over and above that for diesel technology. It may include items such as more-frequent engine servicing, cost of fuel-borne catalyst or other additive, and/or servicing of emission-control device(s).

[4] Use of cryogenic technology not appropriate for gen sets-- cost figures do not include gen sets.

Capital Cost Subtotal

		25-50 hp CA-based												
		$2,963,232												
		$2,963,232	$376,709											
		$2,963,232	$376,709	$444,690										
		$2,963,232	$376,709	$444,690	$467,922									
		$2,963,232	$376,709	$444,690	$467,922	$492,048								
		$2,963,232	$376,709	$444,690	$467,922	$492,048	$517,663							
		$2,963,232	$376,709	$444,690	$467,922	$492,048	$517,663	$544,766						
		$2,963,232	$376,709	$444,690	$467,922	$492,048	$517,663	$544,766	$573,063					
		$2,963,232	$376,709	$444,690	$467,922	$492,048	$517,663	$544,766	$573,063	$602,848				
		$2,963,232	$376,709	$444,690	$467,922	$492,048	$517,663	$544,766	$573,063	$602,848	$634,123			
			$376,709	$444,690	$467,922	$492,048	$517,663	$544,766	$573,063	$602,848	$634,123	$667,184		
$49,741				$444,690	$467,922	$492,048	$517,663	$544,766	$573,063	$602,848	$634,123	$667,184	$701,735	
$49,741	$51,230				$467,922	$492,048	$517,663	$544,766	$573,063	$602,848	$634,123	$667,184	$701,735	$0
$49,741	$51,230					$492,048	$517,663	$544,766	$573,063	$602,848	$634,123	$667,184	$701,735	$0
$49,741	$51,230						$517,663	$544,766	$573,063	$602,848	$634,123	$667,184	$701,735	$0
$49,741	$51,230							$544,766	$573,063	$602,848	$634,123	$667,184	$701,735	$0
$49,741	$51,230								$573,063	$602,848	$634,123	$667,184	$701,735	$0
$49,741	$51,230									$602,848	$634,123	$667,184	$701,735	$0
$49,741	$51,230										$634,123	$667,184	$701,735	$0
$49,741	$51,230											$667,184	$701,735	$0
$49,741	$51,230												$701,735	$0
	$51,230													$0

Capital Cost Subtotal

	25-50 hp Out-of-State														
	$987,632														
	$987,632	$125,570													
	$987,632	$125,570	$146,329												
	$987,632	$125,570	$146,329	$158,073											
	$987,632	$125,570	$146,329	$158,073	$184,115										
	$987,632	$125,570	$146,329	$158,073	$184,115	$172,455									
	$987,632	$125,570	$146,329	$158,073	$184,115	$172,455	$181,889								
	$987,632	$125,570	$146,329	$158,073	$184,115	$172,455	$181,889	$190,922							
	$987,632	$125,570	$146,329	$158,073	$184,115	$172,455	$181,889	$190,922	$201,049						
	$987,632	$125,570	$146,329	$158,073	$184,115	$172,455	$181,889	$190,922	$201,049	$211,474					
		$125,570	$146,329	$158,073	$184,115	$172,455	$181,889	$190,922	$201,049	$211,474	$222,494				
			$146,329	$158,073	$184,115	$172,455	$181,889	$190,922	$201,049	$211,474	$222,494	$233,812			
				$158,073	$184,115	$172,455	$181,889	$190,922	$201,049	$211,474	$222,494	$233,812	$0		
					$184,115	$172,455	$181,889	$190,922	$201,049	$211,474	$222,494	$233,812	$0		
						$172,455	$181,889	$190,922	$201,049	$211,474	$222,494	$233,812	$0		
							$181,889	$190,922	$201,049	$211,474	$222,494	$233,812	$0		
								$190,922	$201,049	$211,474	$222,494	$233,812	$0		
									$201,049	$211,474	$222,494	$233,812	$0		
										$211,474	$222,494	$233,812	$0		
											$222,494	$233,812	$0		
												$233,812	$0		
													$0		

Capital Cost Subtotal

	25-50 hp Gen Sets CA-based			
	$227,247			
	$227,247	$41,414		
	$227,247	$41,414	$51,230	
	$227,247	$41,414	$51,230	$56,294
	$227,247	$41,414	$51,230	$56,294
	$227,247	$41,414	$51,230	$56,294
	$227,247	$41,414	$51,230	$56,294
	$227,247	$41,414	$51,230	$56,294
	$227,247	$41,414	$51,230	$56,294
	$227,247	$41,414	$51,230	$56,294
		$41,414	$51,230	$56,294
			$51,230	$56,294
				$56,294

Capital Cost Subtotal

		25-50 hp CA-based												
		$2,963,232												
		$2,963,232	$376,709											
		$2,963,232	$376,709	$444,690										
		$2,963,232	$376,709	$444,690	$467,922									
		$2,963,232	$376,709	$444,690	$467,922	$492,048								
		$2,963,232	$376,709	$444,690	$467,922	$492,048	$517,663							
		$2,963,232	$376,709	$444,690	$467,922	$492,048	$517,663	$544,766						
		$2,963,232	$376,709	$444,690	$467,922	$492,048	$517,663	$544,766	$573,063					
		$2,963,232	$376,709	$444,690	$467,922	$492,048	$517,663	$544,766	$573,063	$602,848				
		$2,963,232	$376,709	$444,690	$467,922	$492,048	$517,663	$544,766	$573,063	$602,848	$634,123			
			$376,709	$444,690	$467,922	$492,048	$517,663	$544,766	$573,063	$602,848	$634,123	$667,184		
$49,741				$444,690	$467,922	$492,048	$517,663	$544,766	$573,063	$602,848	$634,123	$667,184	$701,735	
$49,741	$51,230				$467,922	$492,048	$517,663	$544,766	$573,063	$602,848	$634,123	$667,184	$701,735	$0
$49,741	$51,230					$492,048	$517,663	$544,766	$573,063	$602,848	$634,123	$667,184	$701,735	$0
$49,741	$51,230						$517,663	$544,766	$573,063	$602,848	$634,123	$667,184	$701,735	$0
$49,741	$51,230							$544,766	$573,063	$602,848	$634,123	$667,184	$701,735	$0
$49,741	$51,230								$573,063	$602,848	$634,123	$667,184	$701,735	$0
$49,741	$51,230									$602,848	$634,123	$667,184	$701,735	$0
$49,741	$51,230										$634,123	$667,184	$701,735	$0
$49,741	$51,230											$667,184	$701,735	$0
$49,741	$51,230												$701,735	$0
	$51,230													$0

Capital Cost Subtotal

	25-50 hp Out-of-State														
	$987,632														
	$987,632	$125,570													
	$987,632	$125,570	$146,329												
	$987,632	$125,570	$146,329	$158,073											
	$987,632	$125,570	$146,329	$158,073	$184,115										
	$987,632	$125,570	$146,329	$158,073	$184,115	$172,455									
	$987,632	$125,570	$146,329	$158,073	$184,115	$172,455	$181,889								
	$987,632	$125,570	$146,329	$158,073	$184,115	$172,455	$181,889	$190,922							
	$987,632	$125,570	$146,329	$158,073	$184,115	$172,455	$181,889	$190,922	$201,049						
	$987,632	$125,570	$146,329	$158,073	$184,115	$172,455	$181,889	$190,922	$201,049	$211,474					
		$125,570	$146,329	$158,073	$184,115	$172,455	$181,889	$190,922	$201,049	$211,474	$222,494				
			$146,329	$158,073	$184,115	$172,455	$181,889	$190,922	$201,049	$211,474	$222,494	$233,812			
				$158,073	$184,115	$172,455	$181,889	$190,922	$201,049	$211,474	$222,494	$233,812	$0		
					$184,115	$172,455	$181,889	$190,922	$201,049	$211,474	$222,494	$233,812	$0		
						$172,455	$181,889	$190,922	$201,049	$211,474	$222,494	$233,812	$0		
							$181,889	$190,922	$201,049	$211,474	$222,494	$233,812	$0		
								$190,922	$201,049	$211,474	$222,494	$233,812	$0		
									$201,049	$211,474	$222,494	$233,812	$0		
										$211,474	$222,494	$233,812	$0		
											$222,494	$233,812	$0		
												$233,812	$0		
													$0		

Capital Cost Subtotal

	25-50 hp Gen Sets CA-based			
	$227,247			
	$227,247	$41,414		
	$227,247	$41,414	$51,230	
	$227,247	$41,414	$51,230	$56,294
	$227,247	$41,414	$51,230	$56,294
	$227,247	$41,414	$51,230	$56,294
	$227,247	$41,414	$51,230	$56,294
	$227,247	$41,414	$51,230	$56,294
	$227,247	$41,414	$51,230	$56,294
	$227,247	$41,414	$51,230	$56,294
		$41,414	$51,230	$56,294
			$51,230	$56,294
				$56,294

Matrix #1

Capital Cost Subtotal

		25-50 hp CA-based												
		$22,549,472												
		$22,549,472	$2,666,664											
		$22,549,472	$2,666,664	$3,016,159										
		$22,549,472	$2,666,664	$3,016,159	$3,173,734									
		$22,549,472	$2,666,664	$3,016,159	$3,173,734	$3,337,370								
		$22,549,472	$2,666,664	$3,016,159	$3,173,734	$3,337,370	$3,511,108							
		$22,549,472	$2,666,664	$3,016,159	$3,173,734	$3,337,370	$3,511,108	$3,694,946						
		$22,549,472	$2,666,664	$3,016,159	$3,173,734	$3,337,370	$3,511,108	$3,694,946	$3,886,865					
		$22,549,472	$2,666,664	$3,016,159	$3,173,734	$3,337,370	$3,511,108	$3,694,946	$3,886,865	$4,088,885				
		$22,549,472	$2,666,664	$3,016,159	$3,173,734	$3,337,370	$3,511,108	$3,694,946	$3,886,865	$4,088,885	$4,301,006			
			$2,666,664	$3,016,159	$3,173,734	$3,337,370	$3,511,108	$3,694,946	$3,886,865	$4,088,885	$4,301,006	$4,525,248		
$337,373				$3,016,159	$3,173,734	$3,337,370	$3,511,108	$3,694,946	$3,886,865	$4,088,885	$4,301,006	$4,525,248	$4,759,591	
$337,373	$347,474				$3,173,734	$3,337,370	$3,511,108	$3,694,946	$3,886,865	$4,088,885	$4,301,006	$4,525,248	$4,759,591	$0
$337,373	$347,474					$3,337,370	$3,511,108	$3,694,946	$3,886,865	$4,088,885	$4,301,006	$4,525,248	$4,759,591	$0
$337,373	$347,474						$3,511,108	$3,694,946	$3,886,865	$4,088,885	$4,301,006	$4,525,248	$4,759,591	$0
$337,373	$347,474							$3,694,946	$3,886,865	$4,088,885	$4,301,006	$4,525,248	$4,759,591	$0
$337,373	$347,474								$3,886,865	$4,088,885	$4,301,006	$4,525,248	$4,759,591	$0
$337,373	$347,474									$4,088,885	$4,301,006	$4,525,248	$4,759,591	$0
$337,373	$347,474										$4,301,006	$4,525,248	$4,759,591	$0
$337,373	$347,474											$4,525,248	$4,759,591	$0
$337,373	$347,474												$4,759,591	$0
	$347,474													$0

Capital Cost Subtotal

		25-50 hp Out-of-State												
		$7,517,164												
		$7,517,164	$955,555											
		$7,517,164	$955,555	$1,006,060										
		$7,517,164	$955,555	$1,006,060	$1,058,565									
		$7,517,164	$955,555	$1,006,060	$1,058,565	$1,113,130								
		$7,517,164	$955,555	$1,006,060	$1,058,565	$1,113,130	$1,169,696							
		$7,517,164	$955,555	$1,006,060	$1,058,565	$1,113,130	$1,169,696	$1,232,322						
		$7,517,164	$955,555	$1,006,060	$1,058,565	$1,113,130	$1,169,696	$1,232,322	$1,294,948					
		$7,517,164	$955,555	$1,006,060	$1,058,565	$1,113,130	$1,169,696	$1,232,322	$1,294,948	$1,363,635				
		$7,517,164	$955,555	$1,006,060	$1,058,565	$1,113,130	$1,169,696	$1,232,322	$1,294,948	$1,363,635	$1,434,342			
			$955,555	$1,006,060	$1,058,565	$1,113,130	$1,169,696	$1,232,322	$1,294,948	$1,363,635	$1,434,342	$1,509,089		
				$1,006,060	$1,058,565	$1,113,130	$1,169,696	$1,232,322	$1,294,948	$1,363,635	$1,434,342	$1,509,089	$1,585,857	
					$1,058,565	$1,113,130	$1,169,696	$1,232,322	$1,294,948	$1,363,635	$1,434,342	$1,509,089	$1,585,857	$0
						$1,113,130	$1,169,696	$1,232,322	$1,294,948	$1,363,635	$1,434,342	$1,509,089	$1,585,857	$0
							$1,169,696	$1,232,322	$1,294,948	$1,363,635	$1,434,342	$1,509,089	$1,585,857	$0
								$1,232,322	$1,294,948	$1,363,635	$1,434,342	$1,509,089	$1,585,857	$0
									$1,294,948	$1,363,635	$1,434,342	$1,509,089	$1,585,857	$0
										$1,363,635	$1,434,342	$1,509,089	$1,585,857	$0
											$1,434,342	$1,509,089	$1,585,857	$0
												$1,509,089	$1,585,857	$0
													$1,585,857	$0
														$0

Capital Cost Subtotal

		25-50 hp Gen Sets CA-based	Use of electric st

Capital Cost Subtotal

		25-50 hp CA-based												
		$31,810,656												
		$31,810,656	$4,044,017											
		$31,810,656	$4,044,017	$4,254,910										
		$31,810,656	$4,044,017	$4,254,910	$4,477,203									
		$31,810,656	$4,044,017	$4,254,910	$4,477,203	$4,708,046								
		$31,810,656	$4,044,017	$4,254,910	$4,477,203	$4,708,046	$4,953,137							
		$31,810,656	$4,044,017	$4,254,910	$4,477,203	$4,708,046	$4,953,137	$5,212,479						
		$31,810,656	$4,044,017	$4,254,910	$4,477,203	$4,708,046	$4,953,137	$5,212,479	$5,483,220					
		$31,810,656	$4,044,017	$4,254,910	$4,477,203	$4,708,046	$4,953,137	$5,212,479	$5,483,220	$5,766,211				
		$31,810,656	$4,044,017	$4,254,910	$4,477,203	$4,708,046	$4,953,137	$5,212,479	$5,483,220	$5,766,211	$6,067,451			
			$4,044,017	$4,254,910	$4,477,203	$4,708,046	$4,953,137	$5,212,479	$5,483,220	$5,766,211	$6,067,451	$6,383,791		
$475,934				$4,254,910	$4,477,203	$4,708,046	$4,953,137	$5,212,479	$5,483,220	$5,766,211	$6,067,451	$6,383,791	$6,714,380	
$475,934	$490,184				$4,477,203	$4,708,046	$4,953,137	$5,212,479	$5,483,220	$5,766,211	$6,067,451	$6,383,791	$6,714,380	$0
$475,934	$490,184					$4,708,046	$4,953,137	$5,212,479	$5,483,220	$5,766,211	$6,067,451	$6,383,791	$6,714,380	$0
$475,934	$490,184						$4,953,137	$5,212,479	$5,483,220	$5,766,211	$6,067,451	$6,383,791	$6,714,380	$0
$475,934	$490,184							$5,212,479	$5,483,220	$5,766,211	$6,067,451	$6,383,791	$6,714,380	$0
$475,934	$490,184								$5,483,220	$5,766,211	$6,067,451	$6,383,791	$6,714,380	$0
$475,934	$490,184									$5,766,211	$6,067,451	$6,383,791	$6,714,380	$0
$475,934	$490,184										$6,067,451	$6,383,791	$6,714,380	$0
$475,934	$490,184											$6,383,791	$6,714,380	$0
$475,934	$490,184												$6,714,380	$0
	$490,184													$0

Capital Cost Subtotal

		25-50 hp Out-of-State												
		$10,604,502												
		$10,604,502	$1,348,006											
		$10,604,502	$1,348,006	$1,419,253										
		$10,604,502	$1,348,006	$1,419,253	$1,493,351									
		$10,604,502	$1,348,006	$1,419,253	$1,493,351	$1,570,298								
		$10,604,502	$1,348,006	$1,419,253	$1,493,351	$1,570,298	$1,650,096							
		$10,604,502	$1,348,006	$1,419,253	$1,493,351	$1,570,298	$1,650,096	$1,736,443						
		$10,604,502	$1,348,006	$1,419,253	$1,493,351	$1,570,298	$1,650,096	$1,736,443	$1,826,790					
		$10,604,502	$1,348,006	$1,419,253	$1,493,351	$1,570,298	$1,650,096	$1,736,443	$1,826,790	$1,923,687				
		$10,604,502	$1,348,006	$1,419,253	$1,493,351	$1,570,298	$1,650,096	$1,736,443	$1,826,790	$1,923,687	$2,023,434			
			$1,348,006	$1,419,253	$1,493,351	$1,570,298	$1,650,096	$1,736,443	$1,826,790	$1,923,687	$2,023,434	$2,126,880		
				$1,419,253	$1,493,351	$1,570,298	$1,650,096	$1,736,443	$1,826,790	$1,923,687	$2,023,434	$2,126,880	$2,237,177	
					$1,493,351	$1,570,298	$1,650,096	$1,736,443	$1,826,790	$1,923,687	$2,023,434	$2,126,880	$2,237,177	$0
						$1,570,298	$1,650,096	$1,736,443	$1,826,790	$1,923,687	$2,023,434	$2,126,880	$2,237,177	$0
							$1,650,096	$1,736,443	$1,826,790	$1,923,687	$2,023,434	$2,126,880	$2,237,177	$0
								$1,736,443	$1,826,790	$1,923,687	$2,023,434	$2,126,880	$2,237,177	$0
									$1,826,790	$1,923,687	$2,023,434	$2,126,880	$2,237,177	$0
										$1,923,687	$2,023,434	$2,126,880	$2,237,177	$0
											$2,023,434	$2,126,880	$2,237,177	$0
												$2,126,880	$2,237,177	$0
													$2,237,177	$0
														$0

Capital Cost Subtotal

		25-50 hp Gen Sets CA-based	Use of cryogenic

									Capital Cost Subtotal 25-50 hp Gen Sets Out-of-State													Capital Cost Subtotal 25-50 hp Reefer Railcars											
									$75,660													$218,220											
									$75,660	$13,805												$218,220	$27,875										
									$75,660	$13,805	$16,977											$218,220	$27,875	$32,764									
									$75,660	$13,805	$16,977	$18,765										$218,220	$27,875	$32,764	$34,551								
$62,251									$75,660	$13,805	$16,977	$18,765	$20,850									$218,220	$27,875	$32,764	$34,551	$36,338							
$62,251	$68,506								$75,660	$13,805	$16,977	$18,765	$20,850	$22,934								$218,220	$27,875	$32,764	$34,551	$36,338	$38,125						
$62,251	$68,506	$75,654							$75,660	$13,805	$16,977	$18,765	$20,850	$22,934	$25,317							$218,220	$27,875	$32,764	$34,551	$36,338	$38,125	$40,210					
$62,251	$68,506	$75,654	$83,100						$75,660	$13,805	$16,977	$18,765	$20,850	$22,934	$25,317	$27,700						$218,220	$27,875	$32,764	$34,551	$36,338	$38,125	$40,210	$42,295				
$62,251	$68,506	$75,654	$83,100	$91,738					$75,660	$13,805	$16,977	$18,765	$20,850	$22,934	$25,317	$27,700	$30,679					$218,220	$27,875	$32,764	$34,551	$36,338	$38,125	$40,210	$42,295	$44,360			
$62,251	$68,506	$75,654	$83,100	$91,738	$100,971				$75,660	$13,805	$16,977	$18,765	$20,850	$22,934	$25,317	$27,700	$30,679	$33,857				$218,220	$27,875	$32,764	$34,551	$36,338	$38,125	$40,210	$42,295	$44,360	$46,762		
$62,251	$68,506	$75,654	$83,100	$91,738	$100,971	$111,398				$13,805	$16,977	$18,765	$20,850	$22,934	$25,317	$27,700	$30,679	$33,857	$37,231				$27,875	$32,764	$34,551	$36,338	$38,125	$40,210	$42,295	$44,360	$46,762	$49,145	
$62,251	$68,506	$75,654	$83,100	$91,738	$100,971	$111,398	$122,714				$16,977	$18,765	$20,850	$22,934	$25,317	$27,700	$30,679	$33,857	$37,231	$40,805				$32,764	$34,551	$36,338	$38,125	$40,210	$42,295	$44,360	$46,762	$49,145	$51,826
$62,251	$68,506	$75,654	$83,100	$91,738	$100,971	$111,398	$122,714	$0				$18,765	$20,850	$22,934	$25,317	$27,700	$30,679	$33,857	$37,231	$40,805	$0				$34,551	$36,338	$38,125	$40,210	$42,295	$44,360	$46,762	$49,145	$51,826
	$68,506	$75,654	$83,100	$91,738	$100,971	$111,398	$122,714	$0					$20,850	$22,934	$25,317	$27,700	$30,679	$33,857	$37,231	$40,805	$0					$36,338	$38,125	$40,210	$42,295	$44,360	$46,762	$49,145	$51,826
		$75,654	$83,100	$91,738	$100,971	$111,398	$122,714	$0						$22,934	$25,317	$27,700	$30,679	$33,857	$37,231	$40,805	$0						$38,125	$40,210	$42,295	$44,360	$46,762	$49,145	$51,826
			$83,100	$91,738	$100,971	$111,398	$122,714	$0							$25,317	$27,700	$30,679	$33,857	$37,231	$40,805	$0							$40,210	$42,295	$44,360	$46,762	$49,145	$51,826
				$91,738	$100,971	$111,398	$122,714	$0								$27,700	$30,679	$33,857	$37,231	$40,805	$0								$42,295	$44,360	$46,762	$49,145	$51,826
					$100,971	$111,398	$122,714	$0									$30,679	$33,857	$37,231	$40,805	$0									$44,360	$46,762	$49,145	$51,826
						$111,398	$122,714	$0										$33,857	$37,231	$40,805	$0										$46,762	$49,145	$51,826
							$122,714	$0											$37,231	$40,805	$0											$49,145	$51,826
								$0												$40,805	$0												$51,826
								$0													$0												

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									Capital Cost Subtotal 25-50 hp Gen Sets Out-of-State													Capital Cost Subtotal 25-50 hp Reefer Railcars											
									$75,660													$218,220											
									$75,660	$13,805												$218,220	$27,875										
									$75,660	$13,805	$16,977											$218,220	$27,875	$32,764									
									$75,660	$13,805	$16,977	$18,765										$218,220	$27,875	$32,764	$34,551								
$62,251									$75,660	$13,805	$16,977	$18,765	$20,850									$218,220	$27,875	$32,764	$34,551	$36,338							
$62,251	$68,506								$75,660	$13,805	$16,977	$18,765	$20,850	$22,934								$218,220	$27,875	$32,764	$34,551	$36,338	$38,125						
$62,251	$68,506	$75,654							$75,660	$13,805	$16,977	$18,765	$20,850	$22,934	$25,317							$218,220	$27,875	$32,764	$34,551	$36,338	$38,125	$40,210					
$62,251	$68,506	$75,654	$83,100						$75,660	$13,805	$16,977	$18,765	$20,850	$22,934	$25,317	$27,700						$218,220	$27,875	$32,764	$34,551	$36,338	$38,125	$40,210	$42,295				
$62,251	$68,506	$75,654	$83,100	$91,738					$75,660	$13,805	$16,977	$18,765	$20,850	$22,934	$25,317	$27,700	$30,679					$218,220	$27,875	$32,764	$34,551	$36,338	$38,125	$40,210	$42,295	$44,360			
$62,251	$68,506	$75,654	$83,100	$91,738	$100,971				$75,660	$13,805	$16,977	$18,765	$20,850	$22,934	$25,317	$27,700	$30,679	$33,857				$218,220	$27,875	$32,764	$34,551	$36,338	$38,125	$40,210	$42,295	$44,360	$46,762		
$62,251	$68,506	$75,654	$83,100	$91,738	$100,971	$111,398				$13,805	$16,977	$18,765	$20,850	$22,934	$25,317	$27,700	$30,679	$33,857	$37,231				$27,875	$32,764	$34,551	$36,338	$38,125	$40,210	$42,295	$44,360	$46,762	$49,145	
$62,251	$68,506	$75,654	$83,100	$91,738	$100,971	$111,398	$122,714				$16,977	$18,765	$20,850	$22,934	$25,317	$27,700	$30,679	$33,857	$37,231	$40,805				$32,764	$34,551	$36,338	$38,125	$40,210	$42,295	$44,360	$46,762	$49,145	$51,826
$62,251	$68,506	$75,654	$83,100	$91,738	$100,971	$111,398	$122,714	$0				$18,765	$20,850	$22,934	$25,317	$27,700	$30,679	$33,857	$37,231	$40,805	$0				$34,551	$36,338	$38,125	$40,210	$42,295	$44,360	$46,762	$49,145	$51,826
	$68,506	$75,654	$83,100	$91,738	$100,971	$111,398	$122,714	$0					$20,850	$22,934	$25,317	$27,700	$30,679	$33,857	$37,231	$40,805	$0					$36,338	$38,125	$40,210	$42,295	$44,360	$46,762	$49,145	$51,826
		$75,654	$83,100	$91,738	$100,971	$111,398	$122,714	$0						$22,934	$25,317	$27,700	$30,679	$33,857	$37,231	$40,805	$0						$38,125	$40,210	$42,295	$44,360	$46,762	$49,145	$51,826
			$83,100	$91,738	$100,971	$111,398	$122,714	$0							$25,317	$27,700	$30,679	$33,857	$37,231	$40,805	$0							$40,210	$42,295	$44,360	$46,762	$49,145	$51,826
				$91,738	$100,971	$111,398	$122,714	$0								$27,700	$30,679	$33,857	$37,231	$40,805	$0								$42,295	$44,360	$46,762	$49,145	$51,826
					$100,971	$111,398	$122,714	$0									$30,679	$33,857	$37,231	$40,805	$0									$44,360	$46,762	$49,145	$51,826
						$111,398	$122,714	$0										$33,857	$37,231	$40,805	$0										$46,762	$49,145	$51,826
							$122,714	$0											$37,231	$40,805	$0											$49,145	$51,826
								$0												$40,805	$0												$51,826
								$0													$0												

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Matrix #1

	Capital Cost Subtotal																											
ndby technology not appropriate for gen sets-- cost figures do not include gen sets.	25-50 hp Gen Sets Out-of-State	Use of electric standby technology not appropriate for gen sets-- cost figures do not include gen sets.	25-50 hp Reefer Railcars	Capital Cost Subtotal																								
			$1,660,604																									
			$1,660,604	$212,121																								
			$1,660,604	$212,121	$222,222																							
			$1,660,604	$212,121	$222,222	$234,343																						
			$1,660,604	$212,121	$222,222	$234,343	$246,464																					
			$1,660,604	$212,121	$222,222	$234,343	$246,464	$258,586																				
			$1,660,604	$212,121	$222,222	$234,343	$246,464	$258,586	$272,727																			
			$1,660,604	$212,121	$222,222	$234,343	$246,464	$258,586	$272,727	$286,868																		
			$1,660,604	$212,121	$222,222	$234,343	$246,464	$258,586	$272,727	$286,868	$301,010																	
			$1,660,604	$212,121	$222,222	$234,343	$246,464	$258,586	$272,727	$286,868	$301,010	$317,171																
				$212,121	$222,222	$234,343	$246,464	$258,586	$272,727	$286,868	$301,010	$317,171	$333,333															
					$222,222	$234,343	$246,464	$258,586	$272,727	$286,868	$301,010	$317,171	$333,333	$351,515														
						$234,343	$246,464	$258,586	$272,727	$286,868	$301,010	$317,171	$333,333	$351,515														
							$246,464	$258,586	$272,727	$286,868	$301,010	$317,171	$333,333	$351,515														
								$258,586	$272,727	$286,868	$301,010	$317,171	$333,333	$351,515														
									$272,727	$286,868	$301,010	$317,171	$333,333	$351,515														
										$286,868	$301,010	$317,171	$333,333	$351,515														
											$301,010	$317,171	$333,333	$351,515														
												$317,171	$333,333	$351,515														
													$333,333	$351,515														
														$351,515														
															2008 - 2020 Capital Co													

	Capital Cost Subtotal																											
echnology not appropriate for gen sets-- cost figures do not include gen sets.	25-50 hp Gen Sets Out-of-State	Use of cryogenic technology not appropriate for gen sets-- cost figures do not include gen sets.	25-50 hp Reefer Railcars	Capital Cost Subtotal																								
			$2,342,623																									
			$2,342,623	$299,240																								
			$2,342,623	$299,240	$313,490																							
			$2,342,623	$299,240	$313,490	$330,569																						
			$2,342,623	$299,240	$313,490	$330,569	$347,669																					
			$2,342,623	$299,240	$313,490	$330,569	$347,669	$364,768																				
			$2,342,623	$299,240	$313,490	$330,569	$347,669	$364,768	$384,737																			
			$2,342,623	$299,240	$313,490	$330,569	$347,669	$364,768	$384,737	$404,687																		
			$2,342,623	$299,240	$313,490	$330,569	$347,669	$364,768	$384,737	$404,687	$424,636																	
			$2,342,623	$299,240	$313,490	$330,569	$347,669	$364,768	$384,737	$404,687	$424,636	$447,435																
				$299,240	$313,490	$330,569	$347,669	$364,768	$384,737	$404,687	$424,636	$447,435	$470,235															
					$313,490	$330,569	$347,669	$364,768	$384,737	$404,687	$424,636	$447,435	$470,235	$495,884														
						$330,569	$347,669	$364,768	$384,737	$404,687	$424,636	$447,435	$470,235	$495,884														
							$347,669	$364,768	$384,737	$404,687	$424,636	$447,435	$470,235	$495,884														
								$364,768	$384,737	$404,687	$424,636	$447,435	$470,235	$495,884														
									$384,737	$404,687	$424,636	$447,435	$470,235	$495,884														
										$404,687	$424,636	$447,435	$470,235	$495,884														
											$424,636	$447,435	$470,235	$495,884														
												$447,435	$470,235	$495,884														
													$470,235	$495,884														
														$495,884														
															2008 - 2020 Capital Co													

Capital Cost Subtotal			Maintenance Cost Subtotal														Maintenance Cost Subtotal																Maintenance Cos		
	Capital Cost Sub-Total	Capital Cost Sub-Total (2002 $)	Annual Mtce Cost2	< 15hp													15-25 hp															25-50 hp CA-based		
	$5,269,944	$3,932,514	$107	$227,375													$94,160															$1,194,334		
	$5,970,798	$4,243,335	$107	$227,375	$33,277												$94,160	$13,268														$1,194,334	$151,833	
	$6,600,013	$4,692,516	$0	$227,375	$33,277	$0											$94,160	$13,268	$0													$1,194,334	$151,833	$0
	$7,674,202	$4,946,859	$0	$227,375	$33,277	$0	$0										$94,160	$13,268	$0	$0												$1,194,334	$151,833	$0
	$6,596,346	$5,277,411	$0	$227,375	$33,277	$0	$0	$0									$94,160	$13,268	$0	$0	$0											$1,194,334	$151,833	$0
	$9,568,528	$5,594,520	$0	$227,375	$33,277	$0	$0	$0	$0								$94,160	$13,268	$0	$0	$0	$0										$1,194,334	$151,833	$0
	$10,594,919	$5,899,648	$0	$227,375	$33,277	$0	$0	$0	$0	$0							$94,160	$13,268	$0	$0	$0	$0	$0									$1,194,334	$151,833	$0
	$11,677,306	$6,192,725	$0	$227,375	$33,277	$0	$0	$0	$0	$0	$0						$94,160	$13,268	$0	$0	$0	$0	$0	$0								$1,194,334	$151,833	$0
	$12,820,455	$6,475,201	$0	$227,375	$33,277	$0	$0	$0	$0	$0	$0	$0					$94,160	$13,268	$0	$0	$0	$0	$0	$0	$0							$1,194,334	$151,833	$0
	$14,026,747	$6,747,105	$0	$227,375	$33,277	$0	$0	$0	$0	$0	$0	$0	$0				$94,160	$13,268	$0	$0	$0	$0	$0	$0	$0	$0						$1,194,334	$151,833	$0
	$10,031,005	$4,595,319	$0		$33,277	$0	$0	$0	$0	$0	$0	$0	$0	$0				$13,268	$0	$0	$0	$0	$0	$0	$0	$0	$0						$151,833	$0
	$10,675,540	$4,657,703	$0			$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0						$0
$0	$10,049,161	$4,175,634	$0				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0					
$0	$9,174,971	$3,630,848						$0	$0	$0	$0	$0	$0	$0	$0	$0					$0	$0	$0	$0	$0	$0	$0	$0	$0	$0					
$0	$8,252,828	$3,110,404							$0	$0	$0	$0	$0	$0	$0	$0						$0	$0	$0	$0	$0	$0	$0	$0	$0					
$0	$7,280,845	$2,613,332								$0	$0	$0	$0	$0	$0	$0							$0	$0	$0	$0	$0	$0	$0	$0					
$0	$6,254,254	$2,138,016									$0	$0	$0	$0	$0	$0								$0	$0	$0	$0	$0	$0	$0					
$0	$5,171,867	$1,683,812										$0	$0	$0	$0	$0									$0	$0	$0	$0	$0	$0					
$0	$4,028,719	$1,249,177											$0	$0	$0	$0										$0	$0	$0	$0	$0					
$0	$2,822,427	$833,470												$0	$0	$0											$0	$0	$0	$0					
$0	$1,548,224	$435,424													$0	$0												$0	$0	$0					
$0	$202,836	$54,329														$0														$0					
st Subtotal (in 2002 $):		$67,340,489																																	

Capital Cost Subtotal			Maintenance Cost Subtotal														Maintenance Cost Subtotal																Maintenance Cos		
	Capital Cost Sub-Total	Capital Cost Sub-Total (2002 $)	Annual Mtce Cost2	< 15hp													15-25 hp															25-50 hp CA-based		
	$5,269,944	$3,932,514	$291	$618,375													$94,160															$1,194,334		
	$5,970,798	$4,243,335	$291	$618,375	$90,501												$94,160	$13,268														$1,194,334	$151,833	
	$6,600,013	$4,692,516	$0	$618,375	$90,501	$0											$94,160	$13,268	$0													$1,194,334	$151,833	$0
	$7,674,202	$4,946,859	$0	$618,375	$90,501	$0	$0										$94,160	$13,268	$0	$0												$1,194,334	$151,833	$0
	$6,596,346	$5,277,411	$0	$618,375	$90,501	$0	$0	$0									$94,160	$13,268	$0	$0	$0											$1,194,334	$151,833	$0
	$9,568,528	$5,594,520	$0	$618,375	$90,501	$0	$0	$0	$0								$94,160	$13,268	$0	$0	$0	$0										$1,194,334	$151,833	$0
	$10,594,919	$5,899,648	$0	$618,375	$90,501	$0	$0	$0	$0	$0							$94,160	$13,268	$0	$0	$0	$0	$0									$1,194,334	$151,833	$0
	$11,677,306	$6,192,725	$0	$618,375	$90,501	$0	$0	$0	$0	$0	$0						$94,160	$13,268	$0	$0	$0	$0	$0	$0								$1,194,334	$151,833	$0
	$12,820,455	$6,475,201	$0	$618,375	$90,501	$0	$0	$0	$0	$0	$0	$0					$94,160	$13,268	$0	$0	$0	$0	$0	$0	$0							$1,194,334	$151,833	$0
	$14,026,747	$6,747,105	$0	$618,375	$90,501	$0	$0	$0	$0	$0	$0	$0	$0				$94,160	$13,268	$0	$0	$0	$0	$0	$0	$0	$0						$1,194,334	$151,833	$0
	$10,031,005	$4,595,319	$0		$90,501	$0	$0	$0	$0	$0	$0	$0	$0	$0				$13,268	$0	$0	$0	$0	$0	$0	$0	$0	$0						$151,833	$0
	$10,675,540	$4,657,703	$0			$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0						$0
$0	$10,049,161	$4,175,634	$0				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0					
$0	$9,174,971	$3,630,848						$0	$0	$0	$0	$0	$0	$0	$0	$0					$0	$0	$0	$0	$0	$0	$0	$0	$0	$0					
$0	$8,252,828	$3,110,404							$0	$0	$0	$0	$0	$0	$0	$0						$0	$0	$0	$0	$0	$0	$0	$0	$0					
$0	$7,280,845	$2,613,332								$0	$0	$0	$0	$0	$0	$0							$0	$0	$0	$0	$0	$0	$0	$0					
$0	$6,254,254	$2,138,016									$0	$0	$0	$0	$0	$0								$0	$0	$0	$0	$0	$0	$0					
$0	$5,171,867	$1,683,812										$0	$0	$0	$0	$0									$0	$0	$0	$0	$0	$0					
$0	$4,028,719	$1,249,177											$0	$0	$0	$0										$0	$0	$0	$0	$0					
$0	$2,822,427	$833,470												$0	$0	$0											$0	$0	$0	$0					
$0	$1,548,224	$435,424													$0	$0												$0	$0	$0					
$0	$202,836	$54,329														$0														$0					
st Subtotal (in 2002 $):		$67,340,489																																	

Matrix #1

	Capital Cost Subtotal		Maintenance Cost Subtotal															Maintenance Cost Subtotal												Maintenance Cos		
	Capital Cost Sub-Total	Capital Cost Sub-Total (2002 $)	Annual Misc Cost < 15hp														15-25 hp												25-50 hp CA-based		
	$37,797,942	$28,203,406	$519	$1,102,675													$456,720												$5,793,076		
	$42,711,066	$30,353,859	$519	$1,102,675	$161,409												$456,720	$64,356											$5,793,076	$736,461	
	$47,672,679	$32,402,114	$519	$1,102,675	$161,409	$169,194											$456,720	$64,356	$66,432										$5,793,076	$736,461	$774,667
	$53,292,876	$34,353,063	$519	$1,102,675	$161,409	$169,194	$176,460										$456,720	$64,356	$66,432	$68,508									$5,793,076	$736,461	$774,667
	$58,983,779	$36,210,924	$519	$1,102,675	$161,409	$169,194	$176,460	$184,764									$456,720	$64,356	$66,432	$68,508	$70,584								$5,793,076	$736,461	$774,667
	$64,957,511	$37,979,311	$519	$1,102,675	$161,409	$169,194	$176,460	$184,764	$193,068								$456,720	$64,356	$66,432	$68,508	$70,584	$72,660							$5,793,076	$736,461	$774,667
	$71,234,272	$39,665,908	$519	$1,102,675	$161,409	$169,194	$176,460	$184,764	$193,068	$201,891							$456,720	$64,356	$66,432	$68,508	$70,584	$72,660	$74,736						$5,793,076	$736,461	$774,667
	$77,824,165	$41,271,616	$519	$1,102,675	$161,409	$169,194	$176,460	$184,764	$193,068	$201,891	$211,233						$456,720	$64,356	$66,432	$68,508	$70,584	$72,660	$74,736	$76,812					$5,793,076	$736,461	$774,667
	$84,747,390	$42,803,161	$519	$1,102,675	$161,409	$169,194	$176,460	$184,764	$193,068	$201,891	$211,233	$221,094					$456,720	$64,356	$66,432	$68,508	$70,584	$72,660	$74,736	$76,812	$79,407				$5,793,076	$736,461	$774,667
	$92,016,070	$44,261,303	$519	$1,102,675	$161,409	$169,194	$176,460	$184,764	$193,068	$201,891	$211,233	$221,094	$230,955				$456,720	$64,356	$66,432	$68,508	$70,584	$72,660	$74,736	$76,812	$79,407	$81,463			$5,793,076	$736,461	$774,667
	$61,652,463	$28,335,326	$519		$161,409	$169,194	$176,460	$184,764	$193,068	$201,891	$211,233	$221,094	$230,955	$241,335				$64,356	$66,432	$68,508	$70,584	$72,660	$74,736	$76,812	$79,407	$81,463	$84,076			$736,461	$774,667
	$64,955,491	$28,339,865	$519			$169,194	$176,460	$184,764	$193,068	$201,891	$211,233	$221,094	$230,955	$241,335	$252,234				$66,432	$68,508	$70,584	$72,660	$74,736	$76,812	$79,407	$81,463	$84,076	$86,673			$774,667
$0	$61,169,636	$25,417,247	$519				$176,460	$184,764	$193,068	$201,891	$211,233	$221,094	$230,955	$241,335	$252,234	$264,171				$68,508	$70,584	$72,660	$74,736	$76,812	$79,407	$81,463	$84,076	$86,673	$89,268			
$0	$55,749,439	$22,061,846						$184,764	$193,068	$201,891	$211,233	$221,094	$230,955	$241,335	$252,234	$264,171					$70,584	$72,660	$74,736	$76,812	$79,407	$81,463	$84,076	$86,673	$89,268			
$0	$50,058,536	$18,866,536							$193,068	$201,891	$211,233	$221,094	$230,955	$241,335	$252,234	$264,171						$72,660	$74,736	$76,812	$79,407	$81,463	$84,076	$86,673	$89,268			
$0	$44,084,804	$15,823,904								$201,891	$211,233	$221,094	$230,955	$241,335	$252,234	$264,171							$74,736	$76,812	$79,407	$81,463	$84,076	$86,673	$89,268			
$0	$37,808,043	$12,924,675									$211,233	$221,094	$230,955	$241,335	$252,234	$264,171								$76,812	$79,407	$81,463	$84,076	$86,673	$89,268			
$0	$31,218,151	$10,163,734										$221,094	$230,955	$241,335	$252,234	$264,171									$79,407	$81,463	$84,076	$86,673	$89,268			
$0	$24,294,925	$7,533,077											$230,955	$241,335	$252,234	$264,171										$81,463	$84,076	$86,673	$89,268			
$0	$17,026,246	$5,027,898												$241,335	$252,234	$264,171											$84,076	$86,673	$89,268			
$0	$9,391,910	$2,641,388													$252,234	$264,171												$86,673	$89,268			
$0	$1,375,756	$368,494														$264,171													$89,268			
t Subtotal (in 2002 $):		$449,599,434																														

	Capital Cost Subtotal		Maintenance Cost Subtotal															Maintenance Cost Subtotal												Maintenance Cos		
	Capital Cost Sub-Total	Capital Cost Sub-Total (2002 $)	Annual Misc Cost < 15hp														15-25 hp												25-50 hp CA-based		
	$53,321,751	$39,769,511	$6,133	$13,032,625													$5,397,040												$68,456,546		
	$60,252,723	$42,820,485	$6,133	$13,032,625	$1,907,363												$5,397,040	$760,492											$68,456,546	$8,702,727	
	$67,534,234	$45,709,626	$6,133	$13,032,625	$1,907,363	$1,999,356											$5,397,040	$760,492	$785,024										$68,456,546	$8,702,727	$9,156,569
	$75,160,533	$48,462,042	$6,133	$13,032,625	$1,907,363	$1,999,356	$2,085,220										$5,397,040	$760,492	$785,024	$809,556									$68,456,546	$8,702,727	$9,156,569
	$83,208,720	$51,082,939	$6,133	$13,032,625	$1,907,363	$1,999,356	$2,085,220	$2,183,348									$5,397,040	$760,492	$785,024	$809,556	$834,088								$68,456,546	$8,702,727	$9,156,569
	$91,635,894	$53,577,609	$6,133	$13,032,625	$1,907,363	$1,999,356	$2,085,220	$2,183,348	$2,281,476								$5,397,040	$760,492	$785,024	$809,556	$834,088	$858,620							$68,456,546	$8,702,727	$9,156,569
	$100,490,553	$55,956,800	$6,133	$13,032,625	$1,907,363	$1,999,356	$2,085,220	$2,183,348	$2,281,476	$2,385,737							$5,397,040	$760,492	$785,024	$809,556	$834,088	$858,620	$883,152						$68,456,546	$8,702,727	$9,156,569
	$109,766,846	$58,222,383	$6,133	$13,032,625	$1,907,363	$1,999,356	$2,085,220	$2,183,348	$2,281,476	$2,385,737	$2,496,131						$5,397,040	$760,492	$785,024	$809,556	$834,088	$858,620	$883,152	$907,684					$68,456,546	$8,702,727	$9,156,569
	$119,553,578	$60,382,681	$6,133	$13,032,625	$1,907,363	$1,999,356	$2,085,220	$2,183,348	$2,281,476	$2,385,737	$2,496,131	$2,612,658					$5,397,040	$760,492	$785,024	$809,556	$834,088	$858,620	$883,152	$907,684	$938,349				$68,456,546	$8,702,727	$9,156,569
	$129,607,541	$62,439,647	$6,133	$13,032,625	$1,907,363	$1,999,356	$2,085,220	$2,183,348	$2,281,476	$2,385,737	$2,496,131	$2,612,658	$2,729,185				$5,397,040	$760,492	$785,024	$809,556	$834,088	$858,620	$883,152	$907,684	$938,349	$962,881			$68,456,546	$8,702,727	$9,156,569
	$87,295,587	$39,972,790	$6,133		$1,907,363	$1,999,356	$2,085,220	$2,183,348	$2,281,476	$2,385,737	$2,496,131	$2,612,658	$2,729,185	$2,851,845				$760,492	$785,024	$809,556	$834,088	$858,620	$883,152	$907,684	$938,349	$962,881	$993,546				$8,702,727	$9,156,569
	$91,633,044	$39,979,193	$6,133			$1,999,356	$2,085,220	$2,183,348	$2,281,476	$2,385,737	$2,496,131	$2,612,658	$2,729,185	$2,851,845	$2,980,838				$785,024	$809,556	$834,088	$858,620	$883,152	$907,684	$938,349	$962,881	$993,546	$1,024,211				$9,156,569
$0	$68,292,319	$35,856,241	$6,133				$2,085,220	$2,183,348	$2,281,476	$2,385,737	$2,496,131	$2,612,658	$2,729,185	$2,851,845	$2,980,838	$3,121,697				$809,556	$834,088	$858,620	$883,152	$907,684	$938,349	$962,881	$993,546	$1,024,211	$1,054,876			
$0	$75,646,020	$31,122,901						$2,183,348	$2,281,476	$2,385,737	$2,496,131	$2,612,658	$2,729,185	$2,851,845	$2,980,838	$3,121,697					$834,088	$858,620	$883,152	$907,684	$938,349	$962,881	$993,546	$1,024,211	$1,054,876			
$0	$70,617,833	$26,615,119							$2,281,476	$2,385,737	$2,496,131	$2,612,658	$2,729,185	$2,851,845	$2,980,838	$3,121,697						$858,620	$883,152	$907,684	$938,349	$962,881	$993,546	$1,024,211	$1,054,876			
$0	$62,100,660	$22,322,862								$2,385,737	$2,496,131	$2,612,658	$2,729,185	$2,851,845	$2,980,838	$3,121,697							$883,152	$907,684	$938,349	$962,881	$993,546	$1,024,211	$1,054,876			
$0	$53,336,000	$18,232,905									$2,496,131	$2,612,658	$2,729,185	$2,851,845	$2,980,838	$3,121,697								$907,684	$938,349	$962,881	$993,546	$1,024,211	$1,054,876			
$0	$44,039,605	$14,338,032										$2,612,658	$2,729,185	$2,851,845	$2,980,838	$3,121,697									$938,349	$962,881	$993,546	$1,024,211	$1,054,876			
$0	$34,272,976	$10,626,950											$2,729,185	$2,851,845	$2,980,838	$3,121,697										$962,881	$993,546	$1,024,211	$1,054,876			
$0	$24,010,012	$7,092,681												$2,851,845	$2,980,838	$3,121,697											$993,546	$1,024,211	$1,054,876			
$0	$13,249,215	$3,726,219													$2,980,838	$3,121,697												$1,024,211	$1,054,876			
$0	$1,940,766	$519,836														$3,121,697													$1,054,876			
t Subtotal (in 2002 $):		$634,252,227																														

t Subtotal											Maintenance Cost Subtotal													Maintenance Cost Subtotal							
										25-50 hp Out-of-State													25-50 hp Gen Sets CA-based								
										$398,147													$83,032								
										$398,147	$50,611												$83,032	$15,132							
										$398,147	$50,611	$0											$83,032	$15,132	$0						
$0										$398,147	$50,611	$0	$0										$83,032	$15,132	$0	$0					
$0	$0									$398,147	$50,611	$0	$0	$0									$83,032	$15,132	$0	$0	$0				
$0	$0	$0								$398,147	$50,611	$0	$0	$0	$0								$83,032	$15,132	$0	$0	$0	$0			
$0	$0	$0	$0							$398,147	$50,611	$0	$0	$0	$0	$0							$83,032	$15,132	$0	$0	$0	$0	$0		
$0	$0	$0	$0	$0						$398,147	$50,611	$0	$0	$0	$0	$0	$0						$83,032	$15,132	$0	$0	$0	$0	$0	$0	
$0	$0	$0	$0	$0	$0					$398,147	$50,611	$0	$0	$0	$0	$0	$0	$0					$83,032	$15,132	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0				$398,147	$50,611	$0	$0	$0	$0	$0	$0	$0	$0				$83,032	$15,132	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0				$50,611	$0	$0	$0	$0	$0	$0	$0	$0	$0				$15,132	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0
	$0	$0	$0	$0	$0	$0	$0	$0	$0					$0	$0	$0	$0	$0	$0	$0	$0	$0					$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0						$0	$0	$0	$0	$0	$0	$0	$0						$0	$0	$0	$0
			$0	$0	$0	$0	$0	$0	$0							$0	$0	$0	$0	$0	$0	$0							$0	$0	$0
				$0	$0	$0	$0	$0	$0								$0	$0	$0	$0	$0	$0								$0	$0
					$0	$0	$0	$0	$0									$0	$0	$0	$0	$0									$0
						$0	$0	$0	$0										$0	$0	$0	$0									
							$0	$0	$0											$0	$0	$0									
								$0	$0												$0	$0									
									$0													$0									

t Subtotal											Maintenance Cost Subtotal													Maintenance Cost Subtotal							
										25-50 hp Out-of-State													25-50 hp Gen Sets CA-based								
										$398,147													$83,032								
										$398,147	$50,611												$83,032	$15,132							
										$398,147	$50,611	$0											$83,032	$15,132	$0						
$0										$398,147	$50,611	$0	$0										$83,032	$15,132	$0	$0					
$0	$0									$398,147	$50,611	$0	$0	$0									$83,032	$15,132	$0	$0	$0				
$0	$0	$0								$398,147	$50,611	$0	$0	$0	$0								$83,032	$15,132	$0	$0	$0	$0			
$0	$0	$0	$0							$398,147	$50,611	$0	$0	$0	$0	$0							$83,032	$15,132	$0	$0	$0	$0	$0		
$0	$0	$0	$0	$0						$398,147	$50,611	$0	$0	$0	$0	$0	$0						$83,032	$15,132	$0	$0	$0	$0	$0	$0	
$0	$0	$0	$0	$0	$0					$398,147	$50,611	$0	$0	$0	$0	$0	$0	$0					$83,032	$15,132	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0				$398,147	$50,611	$0	$0	$0	$0	$0	$0	$0	$0				$83,032	$15,132	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0				$50,611	$0	$0	$0	$0	$0	$0	$0	$0	$0				$15,132	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0
	$0	$0	$0	$0	$0	$0	$0	$0	$0					$0	$0	$0	$0	$0	$0	$0	$0	$0					$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0						$0	$0	$0	$0	$0	$0	$0	$0						$0	$0	$0	$0
			$0	$0	$0	$0	$0	$0	$0							$0	$0	$0	$0	$0	$0	$0							$0	$0	$0
				$0	$0	$0	$0	$0	$0								$0	$0	$0	$0	$0	$0								$0	$0
					$0	$0	$0	$0	$0									$0	$0	$0	$0	$0									$0
						$0	$0	$0	$0										$0	$0	$0	$0									
							$0	$0	$0											$0	$0	$0									
								$0	$0												$0	$0									
									$0													$0									

Matrix #1

t Subtotal										Maintenance Cost Subtotal														Maintenance Cost Subtotal	
										25-50 hp Out-of-State														25-50 hp Gen Sets CA-based	Use of electric standby not appropriate for gen sets-- cost figure
										$1,931,199															
										$1,931,199	$245,487														
										$1,931,199	$245,487	$256,462													
$815,349										$1,931,199	$245,487	$256,462	$271,956												
$815,349	$857,388									$1,931,199	$245,487	$256,462	$271,956	$285,969											
$815,349	$857,388	$902,022								$1,931,199	$245,487	$256,462	$271,956	$285,969	$300,501										
$815,349	$857,388	$902,022	$949,251							$1,931,199	$245,487	$256,462	$271,956	$285,969	$300,501	$316,590									
$815,349	$857,388	$902,022	$949,251	$998,556						$1,931,199	$245,487	$256,462	$271,956	$285,969	$300,501	$316,590	$332,679								
$815,349	$857,388	$902,022	$949,251	$998,556	$1,050,456					$1,931,199	$245,487	$256,462	$271,956	$285,969	$300,501	$316,590	$332,679	$350,325							
$815,349	$857,388	$902,022	$949,251	$998,556	$1,050,456	$1,104,951				$1,931,199	$245,487	$256,462	$271,956	$285,969	$300,501	$316,590	$332,679	$350,325	$368,490						
$815,349	$857,388	$902,022	$949,251	$998,556	$1,050,456	$1,104,951	$1,162,560				$245,487	$256,462	$271,956	$285,969	$300,501	$316,590	$332,679	$350,325	$368,490	$387,693					
$815,349	$857,388	$902,022	$949,251	$998,556	$1,050,456	$1,104,951	$1,162,560	$1,222,764				$256,462	$271,956	$285,969	$300,501	$316,590	$332,679	$350,325	$368,490	$387,693	$407,415				
$815,349	$857,388	$902,022	$949,251	$998,556	$1,050,456	$1,104,951	$1,162,560	$1,222,764	$0				$271,956	$285,969	$300,501	$316,590	$332,679	$350,325	$368,490	$387,693	$407,415	$0			
	$857,388	$902,022	$949,251	$998,556	$1,050,456	$1,104,951	$1,162,560	$1,222,764	$0					$285,969	$300,501	$316,590	$332,679	$350,325	$368,490	$387,693	$407,415	$0			
		$902,022	$949,251	$998,556	$1,050,456	$1,104,951	$1,162,560	$1,222,764	$0						$300,501	$316,590	$332,679	$350,325	$368,490	$387,693	$407,415	$0			
			$949,251	$998,556	$1,050,456	$1,104,951	$1,162,560	$1,222,764	$0							$316,590	$332,679	$350,325	$368,490	$387,693	$407,415	$0			
				$998,556	$1,050,456	$1,104,951	$1,162,560	$1,222,764	$0								$332,679	$350,325	$368,490	$387,693	$407,415	$0			
					$1,050,456	$1,104,951	$1,162,560	$1,222,764	$0									$350,325	$368,490	$387,693	$407,415	$0			
						$1,104,951	$1,162,560	$1,222,764	$0										$368,490	$387,693	$407,415	$0			
							$1,162,560	$1,222,764	$0											$387,693	$407,415	$0			
								$1,222,764	$0												$407,415	$0			
									$0													$0			

t Subtotal										Maintenance Cost Subtotal														Maintenance Cost Subtotal	
										25-50 hp Out-of-State														25-50 hp Gen Sets CA-based	Use of cryogenic technology not appropriate for gen sets-- cost
										$22,620,693															
										$22,620,693	$2,900,909														
										$22,620,693	$2,900,909	$3,054,234													
$9,634,943										$22,620,693	$2,900,909	$3,054,234	$3,213,692												
$9,634,943	$10,131,716									$22,620,693	$2,900,909	$3,054,234	$3,213,692	$3,379,283											
$9,634,943	$10,131,716	$10,659,154								$22,620,693	$2,900,909	$3,054,234	$3,213,692	$3,379,283	$3,551,007										
$9,634,943	$10,131,716	$10,659,154	$11,217,257							$22,620,693	$2,900,909	$3,054,234	$3,213,692	$3,379,283	$3,551,007	$3,741,130									
$9,634,943	$10,131,716	$10,659,154	$11,217,257	$11,799,692						$22,620,693	$2,900,909	$3,054,234	$3,213,692	$3,379,283	$3,551,007	$3,741,130	$3,931,253								
$9,634,943	$10,131,716	$10,659,154	$11,217,257	$11,799,692	$12,413,192					$22,620,693	$2,900,909	$3,054,234	$3,213,692	$3,379,283	$3,551,007	$3,741,130	$3,931,253	$4,139,775							
$9,634,943	$10,131,716	$10,659,154	$11,217,257	$11,799,692	$12,413,192	$13,057,157					$2,900,909	$3,054,234	$3,213,692	$3,379,283	$3,551,007	$3,741,130	$3,931,253	$4,139,775	$4,354,430						
$9,634,943	$10,131,716	$10,659,154	$11,217,257	$11,799,692	$12,413,192	$13,057,157	$13,737,920					$3,054,234	$3,213,692	$3,379,283	$3,551,007	$3,741,130	$3,931,253	$4,139,775	$4,354,430	$4,581,351					
$9,634,943	$10,131,716	$10,659,154	$11,217,257	$11,799,692	$12,413,192	$13,057,157	$13,737,920	$14,449,348					$3,213,692	$3,379,283	$3,551,007	$3,741,130	$3,931,253	$4,139,775	$4,354,430	$4,581,351	$4,814,405				
$9,634,943	$10,131,716	$10,659,154	$11,217,257	$11,799,692	$12,413,192	$13,057,157	$13,737,920	$14,449,348	$0					$3,379,283	$3,551,007	$3,741,130	$3,931,253	$4,139,775	$4,354,430	$4,581,351	$4,814,405	$0			
	$10,131,716	$10,659,154	$11,217,257	$11,799,692	$12,413,192	$13,057,157	$13,737,920	$14,449,348	$0						$3,551,007	$3,741,130	$3,931,253	$4,139,775	$4,354,430	$4,581,351	$4,814,405	$0			
		$10,659,154	$11,217,257	$11,799,692	$12,413,192	$13,057,157	$13,737,920	$14,449,348	$0							$3,741,130	$3,931,253	$4,139,775	$4,354,430	$4,581,351	$4,814,405	$0			
			$11,217,257	$11,799,692	$12,413,192	$13,057,157	$13,737,920	$14,449,348	$0								$3,931,253	$4,139,775	$4,354,430	$4,581,351	$4,814,405	$0			
				$11,799,692	$12,413,192	$13,057,157	$13,737,920	$14,449,348	$0									$4,139,775	$4,354,430	$4,581,351	$4,814,405	$0			
					$12,413,192	$13,057,157	$13,737,920	$14,449,348	$0										$4,354,430	$4,581,351	$4,814,405	$0			
						$13,057,157	$13,737,920	$14,449,348	$0											$4,581,351	$4,814,405	$0			
							$13,737,920	$14,449,348	$0												$4,814,405	$0			
								$14,449,348	$0													$0			

#1

					Maintenance Cost Subtotal													Maintenance Cost Subtotal												Maintenance Cost Subtotal			
				25-50 hp Gen Sets Out-of-State													25-50 hp Reefer Railcars													Maint Cost Sub-Total	Maintenance Cost Sub-Total (2002 $)	Total Annual In-Use Cost	Total Annual In-Use Cost (2002 $
				$27,645													$87,954													$2,112,847	$1,576,480	$7,382,591	$5,509,003
				$27,645	$5,044												$87,954	$11,235												$2,393,047	$1,700,684	$8,363,845	$5,844,029
				$27,645	$5,044	$0											$87,954	$11,235	$0											$2,393,047	$1,619,706	$9,183,060	$6,222,225
				$27,645	$5,044	$0	$0										$87,954	$11,235	$0	$0										$2,393,047	$1,542,579	$10,067,249	$6,489,439
				$27,645	$5,044	$0	$0	$0									$87,954	$11,235	$0	$0	$0									$2,393,047	$1,469,123	$10,989,393	$6,746,534
				$27,645	$5,044	$0	$0	$0	$0								$87,954	$11,235	$0	$0	$0	$0								$2,393,047	$1,399,195	$11,951,575	$6,993,685
				$27,645	$5,044	$0	$0	$0	$0	$0							$87,954	$11,235	$0	$0	$0	$0	$0							$2,393,047	$1,332,638	$12,987,968	$7,232,186
				$27,645	$5,044	$0	$0	$0	$0	$0	$0						$87,954	$11,235	$0	$0	$0	$0	$0	$0						$2,393,047	$1,269,084	$14,070,353	$7,461,809
				$27,645	$5,044	$0	$0	$0	$0	$0	$0	$0					$87,954	$11,235	$0	$0	$0	$0	$0	$0	$0					$2,393,047	$1,208,651	$15,213,502	$7,683,852
$0				$27,645	$5,044	$0	$0	$0	$0	$0	$0	$0	$0				$87,954	$11,235	$0	$0	$0	$0	$0	$0	$0	$0				$2,393,047	$1,151,097	$16,419,794	$7,898,202
$0	$0				$5,044	$0	$0	$0	$0	$0	$0	$0	$0	$0				$11,235	$0	$0	$0	$0	$0	$0	$0	$0	$0			$280,400	$128,454	$10,311,405	$4,723,774
$0	$0	$0				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$10,675,540	$4,657,703
$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$10,049,161	$4,175,634
$0	$0	$0	$0					$0	$0	$0	$0	$0	$0	$0	$0	$0					$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,174,971	$3,630,846
$0	$0	$0	$0						$0	$0	$0	$0	$0	$0	$0	$0						$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$8,252,826	$3,110,404
$0	$0	$0	$0							$0	$0	$0	$0	$0	$0	$0							$0	$0	$0	$0	$0	$0	$0	$0	$0	$7,280,645	$2,613,332
$0	$0	$0	$0								$0	$0	$0	$0	$0	$0								$0	$0	$0	$0	$0	$0	$0	$0	$6,254,254	$2,138,016
$0	$0	$0	$0									$0	$0	$0	$0	$0									$0	$0	$0	$0	$0	$0	$0	$5,171,887	$1,683,812
$0	$0	$0	$0										$0	$0	$0	$0										$0	$0	$0	$0	$0	$0	$4,028,719	$1,249,177
	$0	$0	$0											$0	$0	$0											$0	$0	$0	$0	$0	$2,822,427	$833,470
		$0	$0												$0	$0												$0	$0	$0	$0	$1,548,224	$435,424
			$0													$0													$0	$0	$0	$202,836	$54,329

2008-2020 Maintenance Cost Subtotal (In 2002 $): $14,397,584

2008 - 2020 Total In-Use Compliance Cost (In 2002 $): $81,736,073

Low-Cost Scenario

					Maintenance Cost Subtotal													Maintenance Cost Subtotal												Maintenance Cost Subtotal			
				25-50 hp Gen Sets Out-of-State													25-50 hp Reefer Railcars													Maint Cost Sub-Total	Maintenance Cost Sub-Total (2002 $)	Total Annual In-Use Cost	Total Annual In-Use Cost (2002 $
				$27,645													$87,954													$2,503,647	$1,988,260	$7,773,591	$5,800,773
				$27,645	$5,044												$87,954	$11,235												$2,841,271	$2,019,238	$8,812,069	$6,262,573
				$27,645	$5,044	$0											$87,954	$11,235	$0											$2,841,271	$1,923,084	$9,641,284	$6,525,800
				$27,645	$5,044	$0	$0										$87,954	$11,235	$0	$0										$2,841,271	$1,831,509	$10,515,473	$6,776,368
				$27,645	$5,044	$0	$0	$0									$87,954	$11,235	$0	$0	$0									$2,841,271	$1,744,294	$11,437,617	$7,021,705
				$27,645	$5,044	$0	$0	$0	$0								$87,954	$11,235	$0	$0	$0	$0								$2,841,271	$1,661,232	$12,409,769	$7,255,753
				$27,645	$5,044	$0	$0	$0	$0	$0							$87,954	$11,235	$0	$0	$0	$0	$0							$2,841,271	$1,582,126	$13,438,190	$7,481,774
				$27,645	$5,044	$0	$0	$0	$0	$0	$0						$87,954	$11,235	$0	$0	$0	$0	$0	$0						$2,841,271	$1,506,787	$14,518,577	$7,699,512
				$27,645	$5,044	$0	$0	$0	$0	$0	$0	$0					$87,954	$11,235	$0	$0	$0	$0	$0	$0	$0					$2,841,271	$1,435,035	$15,661,728	$7,910,236
$0				$27,645	$5,044	$0	$0	$0	$0	$0	$0	$0	$0				$87,954	$11,235	$0	$0	$0	$0	$0	$0	$0	$0				$2,841,271	$1,366,700	$16,868,016	$8,113,805
$0	$0				$5,044	$0	$0	$0	$0	$0	$0	$0	$0	$0				$11,235	$0	$0	$0	$0	$0	$0	$0	$0	$0			$337,624	$154,669	$10,368,629	$4,749,889
$0	$0	$0				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$10,675,540	$4,657,703
$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$10,049,161	$4,175,634
$0	$0	$0	$0					$0	$0	$0	$0	$0	$0	$0	$0	$0					$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,174,971	$3,630,846
$0	$0	$0	$0						$0	$0	$0	$0	$0	$0	$0	$0						$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$8,252,826	$3,110,404
$0	$0	$0	$0							$0	$0	$0	$0	$0	$0	$0							$0	$0	$0	$0	$0	$0	$0	$0	$0	$7,280,645	$2,613,332
$0	$0	$0	$0								$0	$0	$0	$0	$0	$0								$0	$0	$0	$0	$0	$0	$0	$0	$6,254,254	$2,138,016
$0	$0	$0	$0									$0	$0	$0	$0	$0									$0	$0	$0	$0	$0	$0	$0	$5,171,887	$1,683,812
$0	$0	$0	$0										$0	$0	$0	$0										$0	$0	$0	$0	$0	$0	$4,028,719	$1,249,177
	$0	$0	$0											$0	$0	$0											$0	$0	$0	$0	$0	$2,822,427	$833,470
		$0	$0												$0	$0												$0	$0	$0	$0	$1,548,224	$435,424
			$0													$0													$0	$0	$0	$202,836	$54,329

2008 - 2020 Maintenance Cost Subtotal (In 2002 $): $17,092,934

2008 - 2020 Total In-Use Compliance Cost (In 2002 $): $84,433,423

High-Cost Scenario

Matrix #1

s do not include gen sets.

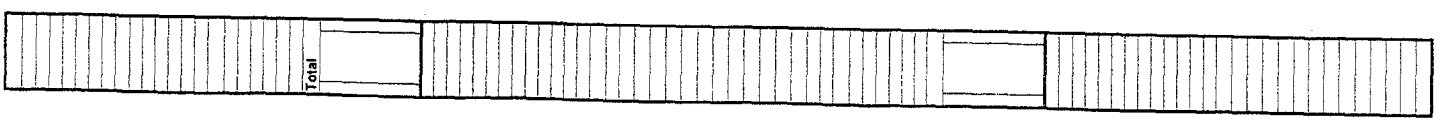
Use of electric standby not appropriate for gen sets-- cost figures do not include gen sets.

Maintenance Cost Subtotal: 25-50 hp Gen Sets Out-of-State	Maintenance Cost Subtotal: 25-50 hp Reefer Railcars															Maintenance Cost Subtotal: Market Cost Sub-Total	Maintenance Cost Sub-Total (2002 $)	Total Annual In-Use Cost	Total Annual In-Use Cost (2002 $)
$426,618																$9,710,490	$7,248,117	$47,508,432	$35,451,523
$426,618	$54,495															$10,972,696	$7,788,092	$53,683,766	$38,102,081
$426,618	$54,495	$57,090														$12,206,743	$8,324,273	$60,171,422	$40,729,387
$426,618	$54,495	$57,090	$60,204													$13,691,220	$8,825,482	$66,884,096	$43,178,546
$426,618	$54,495	$57,090	$60,204	$63,318												$15,153,243	$9,362,777	$74,137,022	$45,513,701
$426,618	$54,495	$57,090	$60,204	$63,318	$66,432											$16,607,926	$9,757,085	$81,645,437	$47,736,396
$426,618	$54,495	$57,090	$60,204	$63,318	$66,432	$70,065										$18,300,459	$10,180,380	$89,534,731	$49,850,289
$426,618	$54,495	$57,090	$60,204	$63,318	$66,432	$70,065	$73,698									$19,993,437	$10,602,947	$97,817,602	$51,874,763
$426,618	$54,495	$57,090	$60,204	$63,318	$66,432	$70,065	$73,698	$77,331								$21,772,050	$10,998,368	$106,519,440	$53,789,556
$426,618	$54,495	$57,090	$60,204	$63,318	$66,432	$70,065	$73,698	$77,331	$81,463							$23,639,412	$11,370,861	$115,655,462	$55,632,264
	$54,495	$57,090	$60,204	$63,318	$66,432	$70,065	$73,698	$77,331	$81,463	$85,635						$15,890,223	$7,278,494	$77,742,886	$35,614,820
		$57,090	$60,204	$63,318	$66,432	$70,065	$73,698	$77,331	$81,463	$85,635	$90,306					$16,607,407	$7,280,880	$81,642,898	$35,620,526
			$60,204	$63,318	$66,432	$70,065	$73,698	$77,331	$81,463	$85,635	$90,306				$0	$15,714,801	$6,528,824	$76,884,437	$31,947,072
				$63,318	$66,432	$70,065	$73,698	$77,331	$81,463	$85,635	$90,306				$0	$14,322,324	$5,667,630	$70,071,763	$27,729,776
					$66,432	$70,065	$73,698	$77,331	$81,463	$85,635	$90,306				$0	$12,660,301	$4,848,912	$62,918,837	$23,713,448
						$70,065	$73,698	$77,331	$81,463	$85,635	$90,306				$0	$11,325,618	$4,065,244	$55,410,422	$19,689,146
							$73,698	$77,331	$81,463	$85,635	$90,306				$0	$9,713,065	$3,320,417	$47,521,128	$16,245,091
								$77,331	$81,463	$85,635	$90,306				$0	$8,020,107	$2,611,117	$39,238,258	$12,774,651
									$81,463	$85,635	$90,306				$0	$6,241,494	$1,935,287	$30,536,619	$9,468,364
										$85,635	$90,306				$0	$4,374,132	$1,291,693	$21,400,378	$6,319,591
											$90,306				$0	$2,412,631	$678,586	$11,804,741	$3,319,974
															$0	$353,439	$94,668	$1,729,193	$463,162
												2008 - 2020 Maintenance Cost Subtotal (in 2002 $):					$115,604,458		
															2008 - 2020 Total In-Use Compliance Cost (in 2002 $):				$565,103,892
															Alternative 1 Scenario (electric standby)				

figures do not include gen sets.

Use of cryogenic technology not appropriate for gen sets-- cost figures do not include gen

Maintenance Cost Subtotal: 25-50 hp Gen Sets Out-of-State	Maintenance Cost Subtotal: 25-50 hp Reefer Railcars															Maintenance Cost Subtotal: Market Cost Sub-Total 25-50 hp	Maintenance Cost Sub-Total (2002 $)	Total Annual In-Use Cost	Total Annual In-Use Cost (2002 $)
$5,041,326																$114,748,430	$85,627,045	$169,070,161	$125,410,550
$5,041,326	$643,965															$129,663,868	$92,149,703	$189,916,809	$134,970,188
$5,041,326	$643,965	$674,630														$145,333,701	$98,367,569	$212,887,935	$144,077,398
$5,041,326	$643,965	$674,630	$711,428													$161,786,540	$104,290,335	$239,969,073	$152,752,378
$5,041,326	$643,965	$674,630	$711,428	$748,226												$179,065,201	$109,920,500	$262,273,921	$161,013,436
$5,041,326	$643,965	$674,630	$711,428	$748,226	$785,024											$197,200,482	$115,289,038	$285,836,376	$169,876,947
$5,041,326	$643,965	$674,630	$711,428	$748,226	$785,024	$827,955										$216,255,713	$120,419,373	$310,746,266	$178,376,173
$5,041,326	$643,965	$674,630	$711,428	$748,226	$785,024	$827,955	$870,886									$236,261,659	$125,294,549	$336,045,507	$185,516,912
$5,041,326	$643,965	$674,630	$711,428	$748,226	$785,024	$827,955	$870,886	$913,817								$257,279,350	$129,643,855	$361,632,926	$190,326,235
$5,041,326	$643,965	$674,630	$711,428	$748,226	$785,024	$827,955	$870,886	$913,817	$962,881							$279,345,884	$134,370,146	$409,153,425	$195,808,783
	$643,965	$674,630	$711,428	$748,226	$785,024	$827,955	$870,886	$913,817	$962,881	$1,011,945						$187,774,061	$86,021,461	$275,026,648	$125,884,251
		$674,630	$711,428	$748,226	$785,024	$827,955	$870,886	$913,817	$962,881	$1,011,945	$1,067,142					$197,194,349	$86,035,241	$288,827,393	$126,014,435
			$711,428	$748,226	$785,024	$827,955	$870,886	$913,817	$962,881	$1,011,945	$1,067,142				$0	$185,701,107	$77,162,648	$271,993,428	$113,019,886
				$748,226	$785,024	$827,955	$870,886	$913,817	$962,881	$1,011,945	$1,067,142				$0	$169,248,268	$68,978,495	$247,892,288	$98,099,398
					$785,024	$827,955	$870,886	$913,817	$962,881	$1,011,945	$1,067,142				$0	$151,969,607	$57,275,747	$222,587,440	$83,890,885
						$827,955	$870,886	$913,817	$962,881	$1,011,945	$1,067,142				$0	$133,834,326	$48,038,809	$196,024,886	$70,361,972
							$870,886	$913,817	$962,881	$1,011,945	$1,067,142				$0	$114,779,095	$39,237,219	$168,115,095	$57,470,124
								$913,817	$962,881	$1,011,945	$1,067,142				$0	$94,773,249	$30,855,450	$139,812,854	$45,193,482
									$962,881	$1,011,945	$1,067,142				$0	$73,755,456	$22,889,201	$109,028,434	$33,486,151
										$1,011,945	$1,067,142				$0	$51,686,924	$15,263,883	$75,707,836	$22,356,763
											$1,067,142				$0	$28,512,317	$8,018,825	$41,761,532	$11,745,044
															$0	$4,176,573	$1,118,888	$6,117,359	$1,638,524
												2008-2020 Maintenance Cost Subtotal (in 2002 $):					$1,384,811,062		
															2008 - 2020 Total In-Use Compliance Cost (in 2002 $):				$1,999,163,288
															Alternative 2 Scenario (cryogenic)				


Total

Matrix #1

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In-Use Compliance Cost Range Estimates Oct. 14, 03

This Matrix calculates the in-use cost of compliance for TRUs and TRU gen sets ("TRUs".) It takes the annual TRU population numbers (same as used for emissions inventory purposes) and multiplies them by the capital and annual costs for the compliance technology shown. The capital costs are amortized over an assumed ten-year useful life, and all annual costs are converted to constant year (2002) dollars using standard present worth analysis techniques.

In this scenario, on a year-by-year basis, population figures for each engine category are multiplied by the annualized capital cost and the early retirement allowance factor; these products are then summed to determine the compliance cost for a given year.

Interest Rates Used for Present Worth Analysis

Capital Costs: 0.05 Real interest rate, which is a 7% nominal rate minus an assumed 2% inflation rate

Annual Costs: 0.05 Real interest rate, which is a 7% nominal rate minus an assumed 2% inflation rate

Assumptions: 10-year useful life for compliance technology; capital cost is amortized over a 10-year period.

Lack of VDECS Scenario:

Early Retirement Allowance Profile (cost factor attributable to ATCM)

Compliance Scenario	Size	Cap. Cost	Ann. Cost	Year 1	2	3	4	5	6	7	8	9	10
LETRU: TRU Replacement	<15 HP	$10,000	$0	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
	15-25 HP	$15,000	$0	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
	>25 HP	$20,000	$0	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
LETRU-GEN: Replacement w/new	>25 HP	$12,000	$0	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
ULETRU: Engine Replacement	<15 HP	$4,000	$0	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	15-25 HP	$4,500	$0	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	>25 HP	$5,000	$0	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
ULETRU-GEN: Engine Replacement	>25	$5,000	$0	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4

Engine Population Category

Engine Model Year	Calendar Year	< 15hp	15-25 hp	25-50 hp CA-based	25-50 hp Out-of-State	25-50 hp Gen Sets CA-based	25-50 hp Gen Sets Out-of-State	25-50 hp Railcar	Reefer Total 25-50 hp (Info Only)	Total (this year)
-2001	2008 All	2125	880	11162	3721	856	285	822	16846	19851
-1998	2008	1061	462	6045	2015	509	170	539	9278	10801
1999	2008	322	195	2215	738	80	27	89	3149	3666
2000	2008	353	139	1803	601	124	41	94	2663	3155
2001	2008	383	84	1099	366	142	47	100	1754	2221
2002	2009	311	124	1419	473	156	52	105	2205	2640
2003	2010	326	128	1493	498	172	57	110	2330	2784
2004	2011	340	132	1571	524	189	63	116	2463	2935
2005	2012	356	136	1652	551	209	70	122	2604	3096
2006	2013	372	140	1738	579	230	77	128	2752	3264
2007	2014	389	144	1829	610	254	85	135	2913	3446
2008	2015	407	148	1924	641	279	93	142	3079	3634
2009	2016	426	153	2024	675	308	103	149	3259	3838
2010	2017	445	157	2129	710	339	113	157	3448	4050
2011	2018	465	162	2240	747	374	125	165	3651	4278
2012	2019	486	167	2356	785	412	137	174	3864	4517
2013	2020	509	172	*	*	*	*	*	*	681
	2021	*	*	*	*	*	*	*	*	*
	2022	*	*	*	*	*	*	*	*	*

Capital Cost Subtotal

Calendar Year	< 15HP																					Capital Cost Subtotal	< 15HP
2008	$1,373,995																					$1,373,995	$206,099
2008	$1,373,995	$416,990																				$1,790,985	$206,099
2008	$1,373,995	$416,990	$457,135																			$2,248,120	$206,099
2008	$1,373,995	$416,990	$457,135	$495,985																		$2,744,105	$206,099
2009	$1,373,995	$416,990	$457,135	$495,985	$402,745																	$3,146,850	$206,099
2010	$1,373,995	$416,990	$457,135	$495,985	$402,745	$168,868																$3,315,718	$206,099
2011	$1,373,995	$416,990	$457,135	$495,985	$402,745	$168,868	$176,120															$3,491,838	$206,099
2012	$1,373,995	$416,990	$457,135	$495,985	$402,745	$168,868	$176,120	$184,408														$3,676,246	$206,099
2013	$1,373,995	$416,990	$457,135	$495,985	$402,745	$168,868	$176,120	$184,408	$192,696													$3,868,942	$206,099
2014	$1,373,995	$416,990	$457,135	$495,985	$402,745	$168,868	$176,120	$184,408	$192,696	$201,502												$4,070,444	$206,099
2015		$416,990	$457,135	$495,985	$402,745	$168,868	$176,120	$184,408	$192,696	$201,502	$210,826											$2,907,275	
2016			$457,135	$495,985	$402,745	$168,868	$176,120	$184,408	$192,696	$201,502	$210,826	$220,668										$2,710,953	
2017				$495,985	$402,745	$168,868	$176,120	$184,408	$192,696	$201,502	$210,826	$220,668	$230,510									$2,484,328	
2018					$402,745	$168,868	$176,120	$184,408	$192,696	$201,502	$210,826	$220,668	$230,510	$240,870								$2,229,213	
2019						$168,868	$176,120	$184,408	$192,696	$201,502	$210,826	$220,668	$230,510	$240,870	$251,748							$2,078,216	
2020							$176,120	$184,408	$192,696	$201,502	$210,826	$220,668	$230,510	$240,870	$251,748	$263,662						$2,173,010	
2021								$184,408	$192,696	$201,502	$210,826	$220,668	$230,510	$240,870	$251,748	$263,662						$1,996,690	
2022									$192,696	$201,502	$210,826	$220,668	$230,510	$240,870	$251,748	$263,662						$1,812,482	

Early Retirement														< 15HP	Early Retirement Cost Subtotal	15-25 HP	Capital Cost Subtotal									
$62,549															$206,099	$897,435										
$62,549	$68,570														$266,648	$897,435	$378,788									
$62,549	$68,570	$74,398													$337,218	$897,435	$378,788	$270,008								
$62,549	$68,570	$74,398	$60,412												$411,616	$897,435	$378,788	$270,008	$163,170							
$62,549	$68,570	$74,398	$60,412	$67,547											$472,028	$897,435	$378,788	$270,008	$163,170	$240,870						
$62,549	$68,570	$74,398	$60,412	$67,547	$70,446										$539,575	$897,435	$378,788	$270,008	$163,170	$240,870	$74,592					
$62,549	$68,570	$74,398	$60,412	$67,547	$70,446	$73,763									$610,023	$897,435	$378,788	$270,008	$163,170	$240,870	$74,592	$76,923				
$62,549	$68,570	$74,398	$60,412	$67,547	$70,446	$73,763	$77,078								$683,788	$897,435	$378,788	$270,008	$163,170	$240,870	$74,592	$76,923	$79,254			
$62,549	$68,570	$74,398	$60,412	$67,547	$70,446	$73,763	$77,078	$80,601							$760,684	$897,435	$378,788	$270,008	$163,170	$240,870	$74,592	$76,923	$79,254	$81,585		
$62,549	$68,570	$74,398	$60,412	$67,547	$70,446	$73,763	$77,078	$80,601	$84,330						$841,465	$897,435	$378,788	$270,008	$163,170	$240,870	$74,592	$76,923	$79,254	$81,585	$83,916	
$62,549	$68,570	$74,398	$60,412	$67,547	$70,446	$73,763	$77,078	$80,601	$84,330	$88,267					$719,696		$378,788	$270,008	$163,170	$240,870	$74,592	$76,923	$79,254	$81,585	$83,916	$86,247
	$68,570	$74,398	$60,412	$67,547	$70,446	$73,763	$77,078	$80,601	$84,330	$88,267	$92,204				$745,415			$270,008	$163,170	$240,870	$74,592	$76,923	$79,254	$81,585	$83,916	$86,247	$89,161
		$74,398	$60,412	$67,547	$70,446	$73,763	$77,078	$80,601	$84,330	$88,267	$92,204	$96,348			$769,049				$163,170	$240,870	$74,592	$76,923	$79,254	$81,585	$83,916	$86,247	$89,161	$91,492
			$60,412	$67,547	$70,446	$73,763	$77,078	$80,601	$84,330	$88,267	$92,204	$96,348	$100,699		$790,999					$240,870	$74,592	$76,923	$79,254	$81,585	$83,916	$86,247	$89,161	$91,492
				$67,547	$70,446	$73,763	$77,078	$80,601	$84,330	$88,267	$92,204	$96,348	$100,699	$105,465	$831,286						$74,592	$76,923	$79,254	$81,585	$83,916	$86,247	$89,161	$91,492
					$70,446	$73,763	$77,078	$80,601	$84,330	$88,267	$92,204	$96,348	$100,699	$105,465	$869,204							$76,923	$79,254	$81,585	$83,916	$86,247	$89,161	$91,492
						$73,763	$77,078	$80,601	$84,330	$88,267	$92,204	$96,348	$100,699	$105,465	$798,756								$79,254	$81,585	$83,916	$86,247	$89,161	$91,492
							$77,078	$80,601	$84,330	$88,267	$92,204	$96,348	$100,699	$105,465	$724,993									$81,585	$83,916	$86,247	$89,161	$91,492

15-25 HP			Capital Cost Subtotal	15-25 HP Early Retirement																15-25 HP Early Retirement Cost Subtotal	25-50 HP CA-based Capital Cost Subtotal					
			$897,435	$134,615																$134,615	$15,656,550					
			$1,276,223	$134,615	$56,818															$191,433	$15,656,550	$5,736,850				
			$1,546,230	$134,615	$56,818	$40,501														$231,935	$15,656,550	$5,736,850	$4,669,770			
			$1,709,400	$134,615	$56,818	$40,501	$24,476													$256,410	$15,656,550	$5,736,850	$4,669,770	$2,846,410		
			$1,950,270	$134,615	$56,818	$40,501	$24,476	$36,131												$292,541	$15,656,550	$5,736,850	$4,669,770	$2,846,410	$3,675,210	
			$2,024,862	$134,615	$56,818	$40,501	$24,476	$36,131	$29,837											$322,377	$15,656,550	$5,736,850	$4,669,770	$2,846,410	$3,675,210	$966,718
			$2,101,785	$134,615	$56,818	$40,501	$24,476	$36,131	$29,837	$30,769										$353,147	$15,656,550	$5,736,850	$4,669,770	$2,846,410	$3,675,210	$966,718
			$2,181,039	$134,615	$56,818	$40,501	$24,476	$36,131	$29,837	$30,769	$31,702									$384,848	$15,656,550	$5,736,850	$4,669,770	$2,846,410	$3,675,210	$966,718
			$2,262,624	$134,615	$56,818	$40,501	$24,476	$36,131	$29,837	$30,769	$31,702	$32,634								$417,482	$15,656,550	$5,736,850	$4,669,770	$2,846,410	$3,675,210	$966,718
			$2,346,540	$134,615	$56,818	$40,501	$24,476	$36,131	$29,837	$30,769	$31,702	$32,634	$33,566							$451,049	$15,656,550	$5,736,850	$4,669,770	$2,846,410	$3,675,210	$966,718
			$1,535,352		$56,818	$40,501	$24,476	$36,131	$29,837	$30,769	$31,702	$32,634	$33,566							$316,433		$5,736,850	$4,669,770	$2,846,410	$3,675,210	$966,718
			$1,245,725			$40,501	$24,476	$36,131	$29,837	$30,769	$31,702	$32,634	$33,566	$34,499	$35,664					$329,778			$4,669,770	$2,846,410	$3,675,210	$966,718
			$1,087,210				$24,476	$36,131	$29,837	$30,769	$31,702	$32,634	$33,566	$34,499	$35,664	$36,597				$325,874				$2,846,410	$3,675,210	$966,718
$94,406			$998,445					$36,131	$29,837	$30,769	$31,702	$32,634	$33,566	$34,499	$35,664	$36,597	$37,762			$339,161					$3,675,210	$966,718
$94,406	$97,319		$854,894						$29,837	$30,769	$31,702	$32,634	$33,566	$34,499	$35,664	$36,597	$37,762	$38,928		$341,958						$966,718
$94,406	$97,319	$100,233	$860,535							$30,769	$31,702	$32,634	$33,566	$34,499	$35,664	$36,597	$37,762	$38,928	$40,093	$352,214						
$94,406	$97,319	$100,233	$803,612								$31,702	$32,634	$33,566	$34,499	$35,664	$36,597	$37,762	$38,928	$40,093	$321,445						
$94,406	$97,319	$100,233	$724,358									$32,634	$33,566	$34,499	$35,664	$36,597	$37,762	$38,928	$40,093	$289,743						

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									25-50 HP CA-based Capital Cost Subtotal	25-50 HP CA-based Early Retirement																	25-50 HP CA-b
									$15,656,550	$2,346,483																	
									$21,393,400	$2,346,483	$860,528																
									$26,063,170	$2,346,483	$860,528	$700,466															
									$28,909,580	$2,346,483	$860,528	$700,466	$426,962														
									$32,584,790	$2,346,483	$860,528	$700,466	$426,962	$551,282													
									$33,551,508	$2,346,483	$860,528	$700,466	$426,962	$551,282	$386,687												
									$34,588,730	$2,346,483	$860,528	$700,466	$426,962	$551,282	$386,687	$406,889											
$1,069,670									$35,638,400	$2,346,483	$860,528	$700,466	$426,962	$551,282	$386,687	$406,889	$427,868										
$1,069,670	$1,125,355								$36,763,755	$2,346,483	$860,528	$700,466	$426,962	$551,282	$386,687	$406,889	$427,868	$450,142									
$1,069,670	$1,125,355	$1,184,278							$37,948,033	$2,346,483	$860,528	$700,466	$426,962	$551,282	$386,687	$406,889	$427,868	$450,142	$473,711								
$1,069,670	$1,125,355	$1,184,278	$1,245,790						$23,537,273		$860,528	$700,466	$426,962	$551,282	$386,687	$406,889	$427,868	$450,142	$473,711	$498,316							
$1,069,670	$1,125,355	$1,184,278	$1,245,790	$1,310,540					$19,110,963			$700,466	$426,962	$551,282	$386,687	$406,889	$427,868	$450,142	$473,711	$498,316	$524,216						
$1,069,670	$1,125,355	$1,184,278	$1,245,790	$1,310,540	$1,378,528				$15,819,720				$426,962	$551,282	$386,687	$406,889	$427,868	$450,142	$473,711	$498,316	$524,216	$551,411					
$1,069,670	$1,125,355	$1,184,278	$1,245,790	$1,310,540	$1,378,528	$1,450,400			$14,423,710					$551,282	$386,687	$406,889	$427,868	$450,142	$473,711	$498,316	$524,216	$551,411	$580,160				
$1,069,670	$1,125,355	$1,184,278	$1,245,790	$1,310,540	$1,378,528	$1,450,400	$1,525,510		$12,274,010						$386,687	$406,889	$427,868	$450,142	$473,711	$498,316	$524,216	$551,411	$580,160	$610,204			
$1,069,670	$1,125,355	$1,184,278	$1,245,790	$1,310,540	$1,378,528	$1,450,400	$1,525,510	$0	$11,307,293							$406,889	$427,868	$450,142	$473,711	$498,316	$524,216	$551,411	$580,160	$610,204			$0
$1,069,670	$1,125,355	$1,184,278	$1,245,790	$1,310,540	$1,378,528	$1,450,400	$1,525,510	$0	$10,290,070								$427,868	$450,142	$473,711	$498,316	$524,216	$551,411	$580,160	$610,204			$0
	$1,125,355	$1,184,278	$1,245,790	$1,310,540	$1,378,528	$1,450,400	$1,525,510	$0	$9,220,400									$450,142	$473,711	$498,316	$524,216	$551,411	$580,160	$610,204			$0

-based Early Retirement Cost Subtotal	25-50 HP Out-of-State	Capital Cost Subtotal														25-50 HP Out-of-State Capital Cost Subtotal	25-50 HP Out-of-State	Early Retirement						
$2,348,483	$5,218,850															$5,218,850	$782,828							
$3,209,010	$5,218,850	$1,911,420														$7,130,270	$782,828	$286,713						
$3,909,476	$5,218,850	$1,911,420	$1,556,590													$8,686,860	$782,828	$286,713	$233,489					
$4,336,437	$5,218,850	$1,911,420	$1,556,590	$947,940												$9,634,800	$782,828	$286,713	$233,489	$142,191				
$4,887,719	$5,218,850	$1,911,420	$1,556,590	$947,940	$1,225,070											$10,859,870	$782,828	$286,713	$233,489	$142,191	$183,761			
$5,274,406	$5,218,850	$1,911,420	$1,556,590	$947,940	$1,225,070	$322,455										$11,182,325	$782,828	$286,713	$233,489	$142,191	$183,761	$128,982		
$5,681,295	$5,218,850	$1,911,420	$1,556,590	$947,940	$1,225,070	$322,455	$339,290									$11,521,615	$782,828	$286,713	$233,489	$142,191	$183,761	$128,982	$135,716	
$6,109,163	$5,218,850	$1,911,420	$1,556,590	$947,940	$1,225,070	$322,455	$339,290	$356,773								$11,878,388	$782,828	$286,713	$233,489	$142,191	$183,761	$128,982	$135,716	$142,709
$6,559,305	$5,218,850	$1,911,420	$1,556,590	$947,940	$1,225,070	$322,455	$339,290	$356,773	$374,903							$12,253,290	$782,828	$286,713	$233,489	$142,191	$183,761	$128,982	$135,716	$142,709
$7,033,016	$5,218,850	$1,911,420	$1,556,590	$947,940	$1,225,070	$322,455	$339,290	$356,773	$374,903	$394,975						$12,646,265	$782,828	$286,713	$233,489	$142,191	$183,761	$128,982	$135,716	$142,709
$5,182,849		$1,911,420	$1,556,590	$947,940	$1,225,070	$322,455	$339,290	$356,773	$374,903	$394,975	$415,048					$7,844,463		$286,713	$233,489	$142,191	$183,761	$128,982	$135,716	$142,709
$4,846,538			$1,556,590	$947,940	$1,225,070	$322,455	$339,290	$356,773	$374,903	$394,975	$415,048	$437,063				$6,370,105			$233,489	$142,191	$183,761	$128,982	$135,716	$142,709
$4,697,463				$947,940	$1,225,070	$322,455	$339,290	$356,773	$374,903	$394,975	$415,048	$437,063	$459,725			$5,273,240				$142,191	$183,761	$128,982	$135,716	$142,709
$4,850,682					$1,225,070	$322,455	$339,290	$356,773	$374,903	$394,975	$415,048	$437,063	$459,725	$483,683		$4,808,983					$183,761	$128,982	$135,716	$142,709
$4,909,604						$322,455	$339,290	$356,773	$374,903	$394,975	$415,048	$437,063	$459,725	$483,683	$508,288	$4,092,200						$128,982	$135,716	$142,709
$4,522,917							$339,290	$356,773	$374,903	$394,975	$415,048	$437,063	$459,725	$483,683	$508,288	$0	$3,769,745						$135,716	$142,709
$4,116,028								$356,773	$374,903	$394,975	$415,048	$437,063	$459,725	$483,683	$508,288	$0	$3,430,455							$142,709
$3,688,160									$374,903	$394,975	$415,048	$437,063	$459,725	$483,683	$508,288	$0	$3,073,683							

						25-50 HP Out-of-State	Early Retirement Cost Subtotal	25-50 HP Gen Sets CA-based	Capital Cost Subtotal														25-50 HP Gen Sets CA-based	Capital Cost Subtotal	25-50 HP Gen Sets CA-based		Early R
							$782,828	$790,986																$790,986	$118,648		
							$1,069,541	$790,986	$124,320															$915,306	$118,648	$18,648	
							$1,303,029	$790,986	$124,320	$192,696														$1,108,002	$118,648	$18,648	$28,904
							$1,445,220	$790,986	$124,320	$192,696	$220,668													$1,328,870	$118,648	$18,648	$28,904
							$1,628,981	$790,986	$124,320	$192,696	$220,668	$242,424												$1,571,094	$118,648	$18,648	$28,904
							$1,757,963	$790,986	$124,320	$192,696	$220,668	$242,424	$111,370											$1,682,464	$118,648	$18,648	$28,904
							$1,893,679	$790,986	$124,320	$192,696	$220,668	$242,424	$111,370	$122,378										$1,804,842	$118,648	$18,648	$28,904
							$2,036,388	$790,986	$124,320	$192,696	$220,668	$242,424	$111,370	$122,378	$135,328									$1,940,169	$118,648	$18,648	$28,904
							$2,186,349	$790,986	$124,320	$192,696	$220,668	$242,424	$111,370	$122,378	$135,328	$148,925								$2,089,094	$118,648	$18,648	$28,904
$157,990							$2,344,339	$790,986	$124,320	$192,696	$220,668	$242,424	$111,370	$122,378	$135,328	$148,925	$164,465							$2,253,559	$118,648	$18,648	$28,904
$157,990	$166,019						$1,727,530		$124,320	$192,696	$220,668	$242,424	$111,370	$122,378	$135,328	$148,925	$164,465	$180,653						$1,643,228		$18,648	$28,904
$157,990	$166,019	$174,825					$1,615,642			$192,696	$220,668	$242,424	$111,370	$122,378	$135,328	$148,925	$164,465	$180,653	$199,430					$1,718,336			$28,904
$157,990	$166,019	$174,825	$183,890				$1,566,044				$220,668	$242,424	$111,370	$122,378	$135,328	$148,925	$164,465	$180,653	$199,430	$219,503				$1,745,142			
$157,990	$166,019	$174,825	$183,890	$193,473			$1,617,326					$242,424	$111,370	$122,378	$135,328	$148,925	$164,465	$180,653	$199,430	$219,503	$242,165			$1,766,639			
$157,990	$166,019	$174,825	$183,890	$193,473	$203,315		$1,636,880						$111,370	$122,378	$135,328	$148,925	$164,465	$180,653	$199,430	$219,503	$242,165	$266,770		$1,790,985			
$157,990	$166,019	$174,825	$183,890	$193,473	$203,315	$0	$1,507,898							$122,378	$135,328	$148,925	$164,465	$180,653	$199,430	$219,503	$242,165	$266,770	$0	$1,679,615			
$157,990	$166,019	$174,825	$183,890	$193,473	$203,315	$0	$1,372,182								$135,328	$148,925	$164,465	$180,653	$199,430	$219,503	$242,165	$266,770	$0	$1,557,238			
$157,990	$166,019	$174,825	$183,890	$193,473	$203,315	$0	$1,229,473									$148,925	$164,465	$180,653	$199,430	$219,503	$242,165	$266,770	$0	$1,421,910			

							25-50 HP Gen Sets CA-based		Capital Cost Subtotal	25-50 HP Gen Sets CA-based			Early Retirement												25-50 HP Gen Sets CA-based		Early Retirement Cost Subtotal	25-50 HP Gen Sets Out-of-State	
													$118,648	$264,180															
													$137,296	$264,180	$41,958														
													$166,200	$264,180	$41,958	$63,714													
$33,100													$199,301	$264,180	$41,958	$63,714	$73,038												
$33,100	$36,364												$235,664	$264,180	$41,958	$63,714	$73,038	$80,808											
$33,100	$36,364	$44,548											$280,212	$264,180	$41,958	$63,714	$73,038	$80,808	$36,908										
$33,100	$36,364	$44,548	$48,951										$329,163	$264,180	$41,958	$63,714	$73,038	$80,808	$36,908	$40,793									
$33,100	$36,364	$44,548	$48,951	$54,131									$383,204	$264,180	$41,958	$63,714	$73,038	$80,808	$36,908	$40,793	$45,325								
$33,100	$36,364	$44,548	$48,951	$54,131	$59,570								$442,664	$264,180	$41,958	$63,714	$73,038	$80,808	$36,908	$40,793	$45,325	$49,858							
$33,100	$36,364	$44,548	$48,951	$54,131	$59,570	$65,786							$508,650	$264,180	$41,958	$63,714	$73,038	$80,808	$36,908	$40,793	$45,325	$49,858	$55,038						
$33,100	$36,364	$44,548	$48,951	$54,131	$59,570	$65,786	$72,261						$462,263		$41,958	$63,714	$73,038	$80,808	$36,908	$40,793	$45,325	$49,858	$55,038	$60,218					
$33,100	$36,364	$44,548	$48,951	$54,131	$59,570	$65,786	$72,261	$79,772					$523,387			$63,714	$73,038	$80,808	$36,908	$40,793	$45,325	$49,858	$55,038	$60,218	$66,693				
$33,100	$36,364	$44,548	$48,951	$54,131	$59,570	$65,786	$72,261	$79,772	$87,601				$582,284				$73,038	$80,808	$36,908	$40,793	$45,325	$49,858	$55,038	$60,218	$66,693	$73,168			
	$36,364	$44,548	$48,951	$54,131	$59,570	$65,786	$72,261	$79,772	$87,601	$96,866			$646,050					$80,808	$36,908	$40,793	$45,325	$49,858	$55,038	$60,218	$66,693	$73,168	$80,938		
		$44,548	$48,951	$54,131	$59,570	$65,786	$72,261	$79,772	$87,601	$96,866	$106,708		$716,394						$36,908	$40,793	$45,325	$49,858	$55,038	$60,218	$66,693	$73,168	$80,938	$88,708	
			$48,951	$54,131	$59,570	$65,786	$72,261	$79,772	$87,601	$96,866	$106,708	$0	$671,846							$40,793	$45,325	$49,858	$55,038	$60,218	$66,693	$73,168	$80,938	$88,708	$0
				$54,131	$59,570	$65,786	$72,261	$79,772	$87,601	$96,866	$106,708	$0	$622,895								$45,325	$49,858	$55,038	$60,218	$66,693	$73,168	$80,938	$88,708	$0
					$59,570	$65,786	$72,261	$79,772	$87,601	$96,866	$106,708	$0	$588,764									$49,858	$55,038	$60,218	$66,693	$73,168	$80,938	$88,708	$0

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	25-50 HP Gen Sets CA-based							Capital Cost Subtotal	25-50 HP Gen Sets CA-based							Early Retirement								25-50 HP Gen Sets CA-based						Early Retirement Cost Subtotal	25-50 HP Gen Sets Out-of-Stat-
$264,180	$39,627																$39,627	$1,396,010													
$306,138	$39,627	$6,294															$45,921	$1,396,010	$230,510												
$369,652	$39,627	$6,294	$9,557														$55,478	$1,396,010	$230,510	$243,460											
$442,890	$39,627	$6,294	$9,557	$10,956													$66,434	$1,396,010	$230,510	$243,460	$259,000										
$523,698	$39,627	$6,294	$9,557	$10,956	$12,121												$78,555	$1,396,010	$230,510	$243,460	$259,000	$271,950									
$560,606	$39,627	$6,294	$9,557	$10,956	$12,121	$14,763											$93,318	$1,396,010	$230,510	$243,460	$259,000	$271,950	$71,225								
$601,398	$39,627	$6,294	$9,557	$10,956	$12,121	$14,763	$16,317										$109,635	$1,396,010	$230,510	$243,460	$259,000	$271,950	$71,225	$75,110							
$646,723	$39,627	$6,294	$9,557	$10,956	$12,121	$14,763	$16,317	$18,130									$127,765	$1,396,010	$230,510	$243,460	$259,000	$271,950	$71,225	$75,110	$78,995						
$696,581	$39,627	$6,294	$9,557	$10,956	$12,121	$14,763	$16,317	$18,130	$19,943								$147,708	$1,396,010	$230,510	$243,460	$259,000	$271,950	$71,225	$75,110	$78,995	$82,880					
$751,618	$39,627	$6,294	$9,557	$10,956	$12,121	$14,763	$16,317	$18,130	$19,943	$22,015							$169,723	$1,396,010	$230,510	$243,460	$259,000	$271,950	$71,225	$75,110	$78,995	$82,880	$87,413				
$547,656		$6,294	$9,557	$10,956	$12,121	$14,763	$16,317	$18,130	$19,943	$22,015	$24,087						$154,183		$230,510	$243,460	$259,000	$271,950	$71,225	$75,110	$78,995	$82,880	$87,413	$91,945			
$572,390			$9,557	$10,956	$12,121	$14,763	$16,317	$18,130	$19,943	$22,015	$24,087	$26,677					$174,566			$243,460	$259,000	$271,950	$71,225	$75,110	$78,995	$82,880	$87,413	$91,945			
$581,844				$10,956	$12,121	$14,763	$16,317	$18,130	$19,943	$22,015	$24,087	$26,677	$29,267				$194,276				$259,000	$271,950	$71,225	$75,110	$78,995	$82,880	$87,413	$91,945			
$589,743					$12,121	$14,763	$16,317	$18,130	$19,943	$22,015	$24,087	$26,677	$29,267	$32,375			$215,695					$271,950	$71,225	$75,110	$78,995	$82,880	$87,413	$91,945			
$597,643						$14,763	$16,317	$18,130	$19,943	$22,015	$24,087	$26,677	$29,267	$32,375	$35,483		$239,057						$71,225	$75,110	$78,995	$82,880	$87,413	$91,945			
$560,735							$16,317	$18,130	$19,943	$22,015	$24,087	$26,677	$29,267	$32,375	$35,483	$0	$224,294							$75,110	$78,995	$82,880	$87,413	$91,945			
$519,943								$18,130	$19,943	$22,015	$24,087	$26,677	$29,267	$32,375	$35,483	$0	$207,977								$78,995	$82,880	$87,413	$91,945			
$474,618									$19,943	$22,015	$24,087	$26,677	$29,267	$32,375	$35,483	$0	$189,847									$82,880	$87,413	$91,945			

						25-50 HP Gen Sets	CA-based	Capital Cost Subtotal	25-50 HP Gen Sets	CA-based	Early Retirement														25-50 HP Gen Sets	CA-based	Early Retirement Cost Subtotal	25-50 HP Gen Se C
					$1,396,010	$209,402																		$209,402	$19,101,626	$2,865,244		$2,865,244
					$1,626,520	$209,402	$34,577																	$243,978	$25,698,794	$3,854,819		$3,854,819
					$1,869,980	$209,402	$34,577	$36,519																$280,497	$31,260,615	$4,689,092		$4,689,092
					$2,128,980	$209,402	$34,577	$36,519	$38,850															$319,347	$34,996,327	$5,249,449		$5,249,449
					$2,400,930	$209,402	$34,577	$36,519	$38,850	$40,793														$360,140	$37,692,762	$5,653,914		$5,653,914
					$2,472,155	$209,402	$34,577	$36,519	$38,850	$40,793	$28,490													$388,630	$37,083,783	$5,384,880	$474,366	$5,859,046
					$2,547,265	$209,402	$34,577	$36,519	$38,850	$40,793	$28,490	$30,044												$416,674	$36,509,020	$5,128,267	$928,229	$6,056,496
					$2,626,260	$209,402	$34,577	$36,519	$38,850	$40,793	$28,490	$30,044	$31,598											$450,272	$35,967,474	$4,884,064	$1,362,819	$6,246,883
					$2,709,140	$209,402	$34,577	$36,519	$38,850	$40,793	$28,490	$30,044	$31,598	$33,152										$483,424	$35,456,955	$4,651,489	$1,778,810	$6,430,300
					$2,796,553	$209,402	$34,577	$36,519	$38,850	$40,793	$28,490	$30,044	$31,598	$33,152	$34,965									$518,389	$34,977,749	$4,429,990	$2,177,793	$6,607,783
					$1,492,488		$34,577	$36,519	$38,850	$40,793	$28,490	$30,044	$31,598	$33,152	$34,965	$36,778								$345,765	$20,951,793	$2,182,763	$2,541,722	$4,724,484
$96,478					$1,358,455			$36,519	$38,850	$40,793	$28,490	$30,044	$31,598	$33,152	$34,965	$36,778	$38,591							$349,780	$16,711,146	$1,409,038	$2,927,023	$4,336,062
$96,478	$101,658				$1,216,653				$38,850	$40,793	$28,490	$30,044	$31,598	$33,152	$34,965	$36,778	$38,591	$40,663					$353,924	$13,558,975	$804,161	$3,279,160	$4,083,322
$96,478	$101,658	$106,838			$1,064,490					$40,793	$28,490	$30,044	$31,598	$33,152	$34,965	$36,778	$38,591	$40,663	$42,735				$357,809	$11,856,486	$421,857	$3,617,642	$4,039,499
$96,478	$101,658	$106,838	$112,665		$905,205						$28,490	$30,044	$31,598	$33,152	$34,965	$36,778	$38,591	$40,663	$42,735	$45,066			$362,082	$9,857,318		$3,942,927	$3,942,927
$96,478	$101,658	$106,838	$112,665	$0	$833,980							$30,044	$31,598	$33,152	$34,965	$36,778	$38,591	$40,663	$42,735	$45,066	$0	$333,592	$8,811,079		$3,524,432	$3,524,432
$96,478	$101,658	$106,838	$112,665	$0	$758,870								$31,598	$33,152	$34,965	$36,778	$38,591	$40,663	$42,735	$45,066	$0	$303,548	$410,491,902	$51,608,828	$26,554,924	$78,163,752
$96,478	$101,658	$106,838	$112,665	$0	$679,875									$33,152	$34,965	$36,778	$38,591	$40,663	$42,735	$45,066	$0	$271,950				

$16,236,382
$21,843,975
$26,571,523
$29,746,878
$32,036,648
$31,224,737
$30,452,524
$29,720,591
$29,026,655
$28,369,966
$16,227,309
$12,375,085
$9,475,654
$7,816,987
$5,914,391
$5,286,648
$332,328,150

Annual Cost-Effectiveness (regulation, PM only)

10/17/2003

The variable used to establish the low and high end scenarios is the annual usage;
1,200 hours/year for the low end (typical short-haul usage) and 3,000 hours/year for the high end (typical long-haul usage.)

VDECS Retrofit: Low-Cost Scenario

Operator Cost Range (2002 $)
(basis for calculations below)
$78,760 $2,346,240

Interest rate for 2008 Cost Pmt. Adj. 0.05

Year	Emission Benefits (tpy)	Annual In-Use Cost (2002 $) (low-cost scenario)	Annual Operator Reporting Cost Range (low)	(high)	In-Use & Operating Costs = Total Ann. Operating Cost (low)	(high)	2008 In-Use Cost Payment Adj. (low)	(high)	PM Cost Effectiveness (In-Use & Rept. Costs Only) $/lb. (low)	$/lb (high)	Not Used for Cost-Effectiveness Calculation: Fac. Rep. Cost Range (low)	(high)	Total Annual Cost (low)	(high)
2000		$0	$0	$0	$0	$0								
2001		$0	$0	$0	$0	$0								
2002		$0	$0	$0	$0	$0								
2003		$0	$0	$0	$0	$0								
2004		$0	$0	$0	$0	$0								
2005		$0	$0	$0	$0	$0								
2006		$0	$0	$0	$0	$0								
2007		$0	$0	$0	$0	$0								
2008	#REF!	$5,509,003	$52,481	$1,563,399	$5,561,484	$7,072,402			See Footnote 1		$198,200	$5,145,153	$198,200	$5,145,153
2009	#REF!	$5,944,029			$5,944,029	$5,944,029	$6,602,879	$6,781,873	#REF!	#REF!	$198,200	$5,145,153	$6,801,079	$11,927,026
2010	#REF!	$6,222,225			$6,222,225	$6,222,225	$6,881,075	$7,060,069	#REF!	#REF!	$198,200	$5,145,153	$7,079,275	$12,205,222
2011	#REF!	$6,489,439			$6,489,439	$6,489,439	$7,148,289	$7,327,283	#REF!	#REF!	$198,200	$5,145,153	$7,346,489	$12,472,436
2012	#REF!	$6,746,534			$6,746,534	$6,746,534	$7,405,385	$7,584,378	#REF!	#REF!	$198,200	$5,145,153	$7,603,585	$12,729,531
2013	#REF!	$6,993,685			$6,993,685	$6,993,685	$7,652,536	$7,831,529	#REF!	#REF!	$198,200	$5,145,153	$7,850,736	$12,976,682
2014	#REF!	$7,232,186			$7,232,186	$7,232,186	$7,891,036	$8,070,030	#REF!	#REF!	$198,200	$5,145,153	$8,089,236	$13,215,183
2015	#REF!	$7,461,809			$7,461,809	$7,461,809	$8,120,659	$8,299,653	#REF!	#REF!	$198,200	$5,145,153	$8,318,859	$13,444,806
2016	#REF!	$7,683,852			$7,683,852	$7,683,852	$8,342,703	$8,521,696	#REF!	#REF!	$198,200	$5,145,153	$8,540,903	$13,666,849
2017	#REF!	$7,898,202			$7,898,202	$7,898,202	$8,557,052	$8,736,046	#REF!	#REF!	$198,200	$5,145,153	$8,755,252	$13,881,199
2018	#REF!	$4,723,774			$4,723,774	$4,723,774	$5,382,624	$5,561,618	#REF!	#REF!	$198,200	$5,145,153	$5,580,824	$10,706,771
2019	#REF!	$4,657,703			$4,657,703	$4,657,703	$5,316,553	$5,495,547	#REF!	#REF!	$198,200	$5,145,153	$5,514,753	$10,640,700
2020	#REF!	$4,175,634			$4,175,634	$4,175,634	$4,834,485	$5,013,478	#REF!	#REF!	$198,200	$5,145,153	$5,032,685	$10,158,631
	#REF!	Tons PM Reduced (13 Yrs.)				Totals:	$84,135,277	$86,283,198	#REF! Minimum	#REF! Maximum	$2,576,600	$66,886,989	$86,711,877 Total Cost Range (2002 $)	$153,170,187

[1]These columns take the 2008 in-use cost and converts it into uniform payments for the years 2009 - 2020
by doing the following: converting the 2008 in-use cost to 2009 dollars, and then converting that amount to a uniform payment series; interest rate used is 5%.
This calculation is performed to account for the 2008 in-use costs, since a cost-effectiveness figure cannot be calculated for this year due to zero PM emission reduction.

VDECS Retrofit: High-Cost Scenario

Operator Cost Range (2002 $)
(basis for calculations below)
$78,760 $2,346,240

Year	Emission Benefits (tpy)	Annual In-Use Cost (2002$) (high-cost scenario)	Annual Operator Reporting Cost Range (low)	(high)	In-Use & Operating Costs = Total Ann. Operating Cost (low)	(high)	2008 In-Use Cost Payment Adj. (low)	(high)	PM Cost Effectiveness (In-Use & Rept. Costs Only) $/lb. (low)	$/lb (high)	Not Used for Cost-Effectiveness Calculation: Fac. Rep. Cost Range (low)	(high)	Total Annual Cost (low)	(high)
2000		$0	$0	$0	$0	$0								
2001		$0	$0	$0	$0	$0								
2002		$0	$0	$0	$0	$0								
2003		$0	$0	$0	$0	$0								
2004		$0	$0	$0	$0	$0								
2005		$0	$0	$0	$0	$0								
2006		$0	$0	$0	$0	$0								
2007		$0	$0	$0	$0	$0								
2008	#REF!	$5,800,773	$52,481	$1,563,399	$5,853,255	$7,364,172			See Footnote 1		$198,200	$5,145,153	$198,200	$5,145,153
2009	#REF!	$6,262,573			$6,262,573	$6,262,573	$6,955,989	$7,134,982	#REF!	#REF!	$198,200	$5,145,153	$7,154,189	$12,280,135
2010	#REF!	$6,525,600			$6,525,600	$6,525,600	$7,219,016	$7,398,009	#REF!	#REF!	$198,200	$5,145,153	$7,417,216	$12,543,162
2011	#REF!	$6,778,368			$6,778,368	$6,778,368	$7,471,784	$7,650,777	#REF!	#REF!	$198,200	$5,145,153	$7,669,984	$12,795,930
2012	#REF!	$7,021,705			$7,021,705	$7,021,705	$7,715,120	$7,894,114	#REF!	#REF!	$198,200	$5,145,153	$7,913,320	$13,039,267
2013	#REF!	$7,255,753			$7,255,753	$7,255,753	$7,949,168	$8,128,162	#REF!	#REF!	$198,200	$5,145,153	$8,147,368	$13,273,315
2014	#REF!	$7,481,774			$7,481,774	$7,481,774	$8,175,189	$8,354,183	#REF!	#REF!	$198,200	$5,145,153	$8,373,389	$13,499,336
2015	#REF!	$7,699,512			$7,699,512	$7,699,512	$8,392,927	$8,571,921	#REF!	#REF!	$198,200	$5,145,153	$8,591,127	$13,717,074
2016	#REF!	$7,910,236			$7,910,236	$7,910,236	$8,603,651	$8,782,645	#REF!	#REF!	$198,200	$5,145,153	$8,801,851	$13,927,798
2017	#REF!	$8,113,805			$8,113,805	$8,113,805	$8,807,221	$8,986,214	#REF!	#REF!	$198,200	$5,145,153	$9,005,421	$14,131,367
2018	#REF!	$4,749,989			$4,749,989	$4,749,989	$5,443,404	$5,622,398	#REF!	#REF!	$198,200	$5,145,153	$5,641,604	$10,787,551
2019	#REF!	$4,657,703			$4,657,703	$4,657,703	$5,351,118	$5,530,112	#REF!	#REF!	$198,200	$5,145,153	$5,549,318	$10,675,265
2020	#REF!	$4,175,634			$4,175,634	$4,175,634	$4,869,050	$5,048,043	#REF!	#REF!	$198,200	$5,145,153	$5,067,250	$10,193,196
	#REF!	Tons PM Reduced (13 Yrs.)				Totals:	$86,953,637	$89,101,558	#REF! Minimum	#REF! Maximum	$2,576,600	$66,886,989	$89,530,237 Total Cost Range (2002 $)	$156,988,547

[1]These columns take the 2008 in-use cost and converts it into uniform payments for the years 2009 - 2020
by doing the following: converting the 2008 costs to 2009 dollars, and then converting that amount to a uniform payment series; interest rate used is 5%.
This calculation is performed to account for the 2008 in-use costs, since a cost-effectiveness figure cannot be calculated for this year due to zero PM emission reduction.

Annual Cost-Effectiveness (regulation, PM only)

10/17/2003

This scenario assumes that VDECS retrofits are not used, and that engine replacement is used for 10 years and newer units, per the ATCM requirements, and that TRU replacement is used for 11 years and older units.

Engine/TRU Replacement Scenario

Operator Cost Range (2002 $)
(basis for calculations below)
$78,760 $2,346,240

Int. rate for 2008 Cost Pmt. Adj.: 0.05

Year	Emission Benefits (tpy)	Annual In-Use Cost (2002 $)	Annual Operator Reporting Cost Range (low)	(high)	In-Use & Operating Costs = Total Ann. Operating Cost (low)	(high)	In-Use Cost Payment Adj. [1] (low)	(high)	PM Cost Effectiveness (In-Use & Rept. Costs Only) $/lb. (low)	$/lb (high)	Not Used for Cost-Effectiveness Calculation: Fac. Rep. Cost Range (low)	(high)	Total Annual Cost (low)	(high)
2000			$0	$0	$0	$0								
2001			$0	$0	$0	$0								
2002			$0	$0	$0	$0								
2003			$0	$0	$0	$0								
2004			$0	$0	$0	$0								
2005		$2,865,244	$0	$0	$2,865,244	$2,865,244								
2006		$3,854,819	$0	$0	$3,854,819	$3,854,819								
2007		$4,689,092	$0	$0	$4,689,092	$4,689,092								
2008	#REF!	$5,249,449	$52,481	$1,563,399	$5,301,930	$6,812,848			See Footnote 1		$198,200	$5,145,153	$198,200	$5,145,153
2009	#REF!	$5,653,914			$5,653,914	$5,653,914	$7,761,708	$7,940,702	#REF!	#REF!	$198,200	$5,145,153	$7,959,908	$13,085,855
2010	#REF!	$5,859,046			$5,859,046	$5,859,046	$7,966,840	$8,145,833	#REF!	#REF!	$198,200	$5,145,153	$8,165,040	$13,290,986
2011	#REF!	$6,056,496			$6,056,496	$6,056,496	$8,164,290	$8,343,284	#REF!	#REF!	$198,200	$5,145,153	$8,362,490	$13,488,437
2012	#REF!	$6,246,883			$6,246,883	$6,246,883	$8,354,677	$8,533,670	#REF!	#REF!	$198,200	$5,145,153	$8,552,877	$13,678,823
2013	#REF!	$6,430,300			$6,430,300	$6,430,300	$8,538,094	$8,717,087	#REF!	#REF!	$198,200	$5,145,153	$8,736,294	$13,862,240
2014	#REF!	$6,607,783			$6,607,783	$6,607,783	$8,715,577	$8,894,570	#REF!	#REF!	$198,200	$5,145,153	$8,913,777	$14,039,723
2015	#REF!	$4,724,484			$4,724,484	$4,724,484	$6,832,278	$7,011,271	#REF!	#REF!	$198,200	$5,145,153	$7,030,478	$12,156,424
2016	#REF!	$4,336,062			$4,336,062	$4,336,062	$6,443,855	$6,622,849	#REF!	#REF!	$198,200	$5,145,153	$6,642,055	$11,768,002
2017	#REF!	$4,083,322			$4,083,322	$4,083,322	$6,191,115	$6,370,109	#REF!	#REF!	$198,200	$5,145,153	$6,389,315	$11,515,262
2018	#REF!	$4,039,499			$4,039,499	$4,039,499	$6,147,293	$6,326,286	#REF!	#REF!	$198,200	$5,145,153	$6,345,493	$11,471,439
2019	#REF!	$3,942,927			$3,942,927	$3,942,927	$6,050,721	$6,229,714	#REF!	#REF!	$198,200	$5,145,153	$6,248,921	$11,374,867
2020	#REF!	$3,524,432			$3,524,432	$3,524,432	$5,632,226	$5,811,219	#REF!	#REF!	$198,200	$5,145,153	$5,830,426	$10,956,372
	#REF!					Totals:	$86,798,674	$88,946,595	**#REF!**	**#REF!**	$2,576,600	$66,886,989	**$89,375,274**	**$155,833,584**
				Tots (all yrs):	**$78,216,233**	**$79,727,150**			**Minimum**	**Maximum**			Total Cost Range (2002 $)	

[1]These columns take the 2005 - 2008 in-use costs and converts them into uniform payments for the years 2009 - 2020
by doing the following: converting the 2008 in-use cost to 2009 dollars, and then converting that amount to a uniform payment series; interest rate used is 5%.
This calculation is performed to account for the 2008 in-use costs, since a cost-effectiveness figure cannot be calculated for this year due to zero PM emission reduction.

Statewide TRU PM Emissions

Scenario #1: LETRU & ULETRU = Electric Standby (revised to reflect 50% emission reduction assumption & non-use w/ gen sets)
(used to calculate Alternative 1 C/E)

Em = Em Rate*Pop*Activity*Avg HP*Load Fctr

<15 hp

Activity = 1038hr/yr, Avg HP = 10 hp, Load Fctr = 0.64
Em = Em Rate*Pop*1038*10*.64

Year	Population	Avg Em Fctr New Std Only	Avg Em Fctr New&In-Use Stds	Emissions (tpd) New Stds Only	Emissions (tpd) New&In-Use Stds
2000	4623	0.87	0.87	0.080	0.080
2001	4449	0.86	0.86	0.077	0.077
2002	4501	0.83	0.83	0.075	0.075
2003	4557	0.81	0.81	0.074	0.074
2004	4623	0.79	0.79	0.073	0.073
2005	4701	0.76	0.76	0.072	0.072
2006	4787	0.74	0.74	0.071	0.071
2007	4879	0.72	0.72	0.070	0.070
2008	4974	0.67	0.58	0.067	0.058
2009	5067	0.62	0.55	0.063	0.056
2010	5174	0.57	0.48	0.059	0.050
2011	5307	0.53	0.42	0.056	0.044
2012	5449	0.48	0.36	0.053	0.039
2013	5621	0.45	0.30	0.050	0.034
2014	5822	0.42	0.25	0.049	0.029
2015	6068	0.39	0.21	0.048	0.025
2016	6354	0.37	0.19	0.047	0.024
2017	6635	0.35	0.19	0.047	0.026
2018	6935	0.34	0.19	0.047	0.027
2019	7248	0.33	0.19	0.047	0.028
2020	7578	0.32	0.19	0.048	0.029

15-25 hp

Activity = 1038hr/yr, Avg HP = 17 hp, Load Fctr = 0.64
Em = Em Rate*Pop*1038*17*.64

Year	Population	Avg Em Fctr New Std Only	Avg Em Fctr New&In-Use Stds	Emissions (tpd) New Stds Only	Emissions (tpd) New&In-Use Stds
2000	1947	0.87	0.87	0.058	0.058
2001	1898	0.86	0.86	0.055	0.055
2002	1897	0.83	0.83	0.054	0.054
2003	1899	0.81	0.81	0.052	0.052
2004	1905	0.79	0.79	0.051	0.051
2005	1914	0.77	0.77	0.050	0.050
2006	1927	0.74	0.74	0.049	0.049
2007	1945	0.72	0.72	0.048	0.048
2008	1961	0.67	0.58	0.045	0.039
2009	1973	0.63	0.55	0.042	0.037
2010	1989	0.58	0.49	0.039	0.033
2011	2012	0.53	0.42	0.037	0.029
2012	2040	0.49	0.36	0.034	0.025
2013	2073	0.46	0.30	0.032	0.021
2014	2112	0.43	0.25	0.031	0.018
2015	2167	0.40	0.20	0.030	0.015
2016	2231	0.38	0.18	0.029	0.014
2017	2296	0.36	0.18	0.028	0.014
2018	2364	0.34	0.19	0.028	0.015
2019	2434	0.33	0.19	0.027	0.015
2020	2507	0.32	0.19	0.027	0.016

Relative Emission Reduction Effectiveness Compared to Limits of Reg

Year	Em. Red. Alt.1 (tpd) [1]	Em. Red. Reg. (low end, tpd)	Em. Red. Reg. (high end, tpd)	% More Effect. Than Reg. (l)	% More Effect. Than Reg. (h)
2008	0.937	0.498	0.948	88	-1
2009	0.859	0.416	0.853	107	1
2010	0.786	0.237	0.733	232	7
2011	0.718	0.234	0.684	207	5
2012	0.657	0.474	0.681	39	-4
2013	0.570	0.5	0.639	14	-11
2014	0.495	0.538	0.618	-8	-20
2015	0.436	0.61	0.593	-29	-27
2016	0.384	0.599	0.549	-36	-30
2017	0.337	0.55	0.497	-39	-32
2018	0.294	0.513	0.458	-43	-36
2019	0.256	0.488	0.43	-47	-40
2020	0.224	0.474	0.348	-53	-36
Total tpd:	6.954				

1 This is 1/2 the baseline, since it is assumed that 1/2 of baseline emissions will still be generated during on-road (mobile) operation.

Tot. PM red.(lbs. 5076198

Matrix #3

25-50 hp TRUs, reefer railcars, gen sets

Activity = 1465hr/yr, Avg HP = 34 hp, Load Fctr = 0.53
Em = Em Rate*Pop*1465*34*.53

Year	CA-Based Population	Out-of-State Population	Reefer Railcar Population	CA Gen Set Population	OOS Gen Set Population	Total 25-50 hp Population	Avg Em Fctr New Stds Only	Avg Em Fctr New&In-Use Stds	Emissions (tpd). New Stds Only	Emissions (tpd) New&In-Use Stds
2000	22772	7591	1678	0	0	32041	0.98	0.98	2.501	2.501
2001	22606	7535	1666	0	0	31807	0.92	0.92	2.332	2.332
2002	22778	7593	1678	0	0	32049	0.89	0.89	2.281	2.281
2003	22986	7662	1694	0	0	32341	0.87	0.87	2.231	2.231
2004	23230	7743	1712	0	0	32685	0.83	0.83	2.151	2.151
2005	23515	7838	1733	0	0	33086	0.79	0.79	2.073	2.073
2006	23814	7938	1755	0	0	33507	0.75	0.75	1.992	1.992
2007	24112	8037	1777	0	0	33926	0.71	0.71	1.909	1.909
2008	24409	8136	1799	0	0	34343	0.64	0.48	1.763	1.324
2009	24714	8238	1821	0	0	34774	0.58	0.45	1.614	1.248
2010	25109	8370	1850	0	0	35329	0.52	0.45	1.473	1.273
2011	25638	8546	1889	0	0	36073	0.47	0.40	1.344	1.152
2012	26266	8755	1935	0	0	36957	0.42	0.28	1.226	0.826
2013	27033	9011	1992	0	0	38035	0.35	0.21	1.057	0.641
2014	28006	9335	2064	0	0	39405	0.29	0.15	0.911	0.469
2015	29226	9742	2154	0	0	41122	0.24	0.09	0.794	0.296
2016	30650	10217	2259	0	0	43126	0.20	0.06	0.692	0.208
2017	32165	10722	2370	0	0	45257	0.17	0.04	0.598	0.157
2018	33785	11262	2489	0	0	47535	0.14	0.03	0.513	0.105
2019	35509	11836	2616	0	0	49961	0.11	0.01	0.438	0.052
2020	37344	12448	2752	0	0	52543	0.09	0.00	0.372	0.000

Composite PM Emissions of all TRU HP ranges

Operator Cost Range (2002 $)
(basis for calculations below)
$78,760 $2,346,240

Year	Emissions (tpd) New Stds Only	Annual In-Use Cost	Ann. Op. Rep. Costs (low)	Ann. Op. Rep. Costs (high)	Total Ann. Oper. Cost (low)	Total Ann. Oper. Cost (high)	Annual Cost-Effectiveness In-Use Only $/lb. (low)	In-Use Only $/lb (high)
2000	2.640	$0	$0	$0	$0	$0		
2001	2.464	$0	$0	$0	$0	$0		
2002	2.410	$0	$0	$0	$0	$0		
2003	2.357	$0	$0	$0	$0	$0		
2004	2.276	$0	$0	$0	$0	$0		
2005	2.194	$0	$0	$0	$0	$0		
2006	2.112	$0	$0	$0	$0	$0		
2007	2.028	$0	$0	$0	$0	$0		
2008	1.875	$35,451,523	$58,772	$1,750,800	$35,510,295	$37,202,324	51.90	54.37
2009	1.719	$38,152,051	$55,973	$1,667,429	$38,208,024	$39,819,479	60.90	63.47
2010	1.571	$40,726,387	$53,308	$1,588,028	$40,779,695	$42,314,415	71.10	73.78
2011	1.437	$43,178,546	$50,769	$1,512,407	$43,229,315	$44,690,953	82.43	85.22
2012	1.314	$45,513,701	$48,352	$1,440,388	$45,562,052	$46,954,088	95.02	97.92
2013	1.140	$47,736,396	$46,049	$1,371,798	$47,782,445	$49,108,194	114.84	118.02
2014	0.990	$49,856,289	$43,857	$1,306,474	$49,900,145	$51,162,763	138.04	141.53
2015	0.872	$51,874,763	$41,768	$1,244,261	$51,916,531	$53,119,024	163.20	166.98
2016	0.768	$53,799,556	$39,779	$1,185,011	$53,839,335	$54,984,566	191.95	196.03
2017	0.673	$55,632,264	$37,885	$1,128,582	$55,670,149	$56,760,846	226.48	230.92
2018	0.588	$35,614,820	$36,081	$1,074,840	$35,650,901	$36,689,660	166.11	170.95
2019	0.513	$35,620,526	$34,383	$1,023,657	$35,654,889	$36,644,183	190.60	195.89
2020	0.448	$31,947,072	$32,726	$974,911	$31,979,798	$32,921,983	195.67	201.44
	11821.700		$579,682	$17,268,585	$565,683,574	$582,372,477	**Low = 52**	**H = 231**

Tons PM $565,103,892 **2008-2020 Total (in 2002 $)**

Statewide TRU PM Emissions

Scenario #2: LETRU & ULETRU = Full Cryogenic Refrigeration to LETRU & ULETRU, 1200 Hr/Yr. Scenario (revised to equalize effectiveness against lower and upper emission benefit of reg; also changed to reflect non-use w/ TRU gen sets.) (used to calculate Alternative 2 C/E)

Em = Em Rate*Pop*Activity*Avg HP*Load Fctr

<15 hp

Activity = 1038hr/yr, Avg HP = 10 hp, Load Fctr = 0.64
Em = Em Rate*Pop*1038*10*.64

Year	Population	Avg Em Fctr New Std Only	Avg Em Fctr New&In-Use Stds	Emissions (tpd) New Stds Only	Emissions (tpd) New&In-Use Stds
2000	4623	0.87	0.87	0.080	0.080
2001	4449	0.86	0.86	0.077	0.077
2002	4501	0.83	0.83	0.075	0.075
2003	4557	0.81	0.81	0.074	0.074
2004	4623	0.79	0.79	0.073	0.073
2005	4701	0.76	0.76	0.072	0.072
2006	4787	0.74	0.74	0.071	0.071
2007	4879	0.72	0.72	0.070	0.070
2008	4974	0.67	0.58	0.067	0.058
2009	5067	0.62	0.55	0.063	0.056
2010	5174	0.57	0.48	0.059	0.050
2011	5307	0.53	0.42	0.056	0.044
2012	5449	0.48	0.36	0.053	0.039
2013	5621	0.45	0.30	0.050	0.034
2014	5822	0.42	0.25	0.049	0.029
2015	6068	0.39	0.21	0.048	0.025
2016	6354	0.37	0.19	0.047	0.024
2017	6635	0.35	0.19	0.047	0.026
2018	6935	0.34	0.19	0.047	0.027
2019	7248	0.33	0.19	0.047	0.028
2020	7578	0.32	0.19	0.048	0.029

15-25 hp

Activity = 1038hr/yr, Avg HP = 17 hp, Load Fctr = 0.64
Em = Em Rate*Pop*1038*17*.64

Year	Population	Avg Em Fctr New Std Only	Avg Em Fctr New&In-Use Stds	Emissions (tpd) New Stds Only	Emissions (tpd) New&In-Use Stds
2000	1947	0.87	0.87	0.058	0.058
2001	1898	0.86	0.86	0.055	0.055
2002	1897	0.83	0.83	0.054	0.054
2003	1899	0.81	0.81	0.052	0.052
2004	1905	0.79	0.79	0.051	0.051
2005	1914	0.77	0.77	0.050	0.050
2006	1927	0.74	0.74	0.049	0.049
2007	1945	0.72	0.72	0.048	0.048
2008	1961	0.67	0.58	0.045	0.039
2009	1973	0.63	0.55	0.042	0.037
2010	1989	0.58	0.49	0.039	0.033
2011	2012	0.53	0.42	0.037	0.029
2012	2040	0.49	0.36	0.034	0.025
2013	2073	0.46	0.30	0.032	0.021
2014	2112	0.43	0.25	0.031	0.018
2015	2167	0.40	0.20	0.030	0.015
2016	2231	0.38	0.18	0.029	0.014
2017	2296	0.36	0.18	0.028	0.014
2018	2364	0.34	0.19	0.028	0.015
2019	2434	0.33	0.19	0.027	0.015
2020	2507	0.32	0.19	0.027	0.016

Relative Emission Reduction Effectiveness Compared to Limits of Reg

Year	Em. Red. Alt.2 (tpd)	Em. Red. Reg. (low end, tpd)	Em. Red. Reg. (high end, tpd)	% More Effect. Than Reg. (l)	% More Effect. Than Reg. (h)
2008	1.875	0.498	0.948	276	98
2009	1.719	0.416	0.853	313	102
2010	1.571	0.237	0.733	563	114
2011	1.437	0.234	0.684	514	110
2012	1.314	0.474	0.681	177	93
2013	1.140	0.5	0.639	128	78
2014	0.990	0.538	0.618	84	60
2015	0.872	0.61	0.593	43	47
2016	0.768	0.599	0.549	28	40
2017	0.673	0.55	0.497	22	36
2018	0.588	0.513	0.458	15	28
2019	0.513	0.488	0.43	5	19
2020	0.448	0.474	0.348	-6	29
Total (tpd):	13.907				
Tot. PM Red.(lb	10152397				

25-50 hp TRUs, reefer railcars, gen sets

Activity = 1465hr/yr, Avg HP = 34 hp, Load Fctr = 0.53
Em = Em Rate*Pop*1465*34*.53

Year	CA-Based Population	Out-of-State Population	Reefer Railcar Population	CA Gen Set Population	OOS Gen Set Population	Total 25-50 hp Population	Avg Em Fctr New Stds Only	Avg Em Fctr New&In-Use Stds	Emissions (tpd) New Stds Only	Emissions (tpd) New&In-Use Stds
2000	22772	7591	1678	0	0	32041	0.98	0.98	2.501	2.501
2001	22606	7535	1666	0	0	31807	0.92	0.92	2.332	2.332
2002	22778	7593	1678	0	0	32049	0.89	0.89	2.281	2.281
2003	22986	7662	1694	0	0	32341	0.87	0.87	2.231	2.231
2004	23230	7743	1712	0	0	32685	0.83	0.83	2.151	2.151
2005	23515	7838	1733	0	0	33086	0.79	0.79	2.073	2.073
2006	23814	7938	1755	0	0	33507	0.75	0.75	1.992	1.992
2007	24112	8037	1777	0	0	33926	0.71	0.71	1.909	1.909
2008	24409	8136	1799	0	0	34343	0.64	0.48	1.763	1.324
2009	24714	8238	1821	0	0	34774	0.58	0.45	1.614	1.248
2010	25109	8370	1850	0	0	35329	0.52	0.45	1.473	1.273
2011	25638	8546	1889	0	0	36073	0.47	0.40	1.344	1.152
2012	26266	8755	1935	0	0	36957	0.42	0.28	1.226	0.826
2013	27033	9011	1992	0	0	38035	0.35	0.21	1.057	0.641
2014	28006	9335	2064	0	0	39405	0.29	0.15	0.911	0.469
2015	29226	9742	2154	0	0	41122	0.24	0.09	0.794	0.296
2016	30650	10217	2259	0	0	43126	0.20	0.06	0.692	0.208
2017	32165	10722	2370	0	0	45257	0.17	0.04	0.598	0.157
2018	33785	11262	2489	0	0	47535	0.14	0.03	0.513	0.105
2019	35509	11836	2616	0	0	49961	0.11	0.01	0.438	0.052
2020	37344	12448	2752	0	0	52543	0.09	0.00	0.372	0.000

Composite PM Emissions of all TRU HP ranges

Operator Cost Range (2002 $)
(basis for calculations below)
$78,760 $2,346,240

Year	Emissions (tpd) New Stds On	Emission Red. From Reg. (low end of range)	Emission Benefit Adjustment Factor (low)	Emission Red. From Reg. (high end of range)	Emission Benefit Adjustment Factor (high)	Annual In-Use Cost	Ann. Op. Rep. Costs (low)	Ann. Op. Rep. Costs (high)	Total Ann. Oper. Cost (low)	Total Ann. Oper. Cost (high)	In-Use Only $/lb. (low)	In-Use Only $/lb (high)
2000	2.640					$0	$0	$0	$0	$0		
2001	2.464					$0	$0	$0	$0	$0		
2002	2.410					$0	$0	$0	$0	$0		
2003	2.357					$0	$0	$0	$0	$0		
2004	2.276					$0	$0	$0	$0	$0		
2005	2.194					$0	$0	$0	$0	$0		
2006	2.112					$0	$0	$0	$0	$0		
2007	2.028					$0	$0	$0	$0	$0		
2008	1.875	0.498	0.266	0.948	0.506	$125,416,556	$58,772	$1,750,800	$125,475,328	$127,167,357	24.36	47.00
2009	1.719	0.416	0.242	0.853	0.496	$134,970,188	$55,973	$1,667,429	$135,026,162	$136,637,617	26.04	54.04
2010	1.571	0.237	0.151	0.733	0.466	$144,077,398	$53,308	$1,588,028	$144,130,705	$145,665,425	18.95	59.24
2011	1.437	0.234	0.163	0.684	0.476	$152,752,378	$50,769	$1,512,407	$152,803,147	$154,264,785	23.73	70.02
2012	1.314	0.474	0.361	0.681	0.518	$161,013,436	$48,352	$1,440,388	$161,061,788	$162,453,824	60.60	87.81
2013	1.140	0.5	0.439	0.639	0.561	$168,876,647	$46,049	$1,371,798	$168,922,696	$170,248,445	89.03	114.67
2014	0.990	0.538	0.543	0.618	0.624	$176,376,173	$43,857	$1,306,474	$176,420,030	$177,682,647	132.55	153.35
2015	0.872	0.61	0.700	0.593	0.680	$183,516,912	$41,768	$1,244,261	$183,558,680	$184,761,173	201.92	197.58
2016	0.768	0.599	0.779	0.549	0.714	$190,326,235	$39,779	$1,185,011	$190,366,015	$191,511,246	264.52	243.89
2017	0.673	0.55	0.817	0.497	0.738	$196,809,793	$37,885	$1,128,582	$196,847,678	$197,938,375	327.01	297.14
2018	0.588	0.513	0.872	0.458	0.779	$125,994,251	$36,081	$1,074,840	$126,030,332	$127,069,090	256.17	230.59
2019	0.513	0.488	0.952	0.43	0.839	$126,014,435	$34,363	$1,023,657	$126,048,797	$127,038,091	320.80	284.89
2020	0.448	0.474	1.059	0.348	0.777	$113,018,886	$32,726	$974,911	$113,051,613	$113,993,798	366.12	271.03
	11821.700 Tons PM						$579,682	$17,268,585	$1,999,742,971	$2,016,431,873	Low = 24	H = 366

$1,999,163,288 2008-2020 Total (In 2002 $)

Chart 1
Estimated Fleet Size of Motor Carriers with (or Likely to Have) TRUs

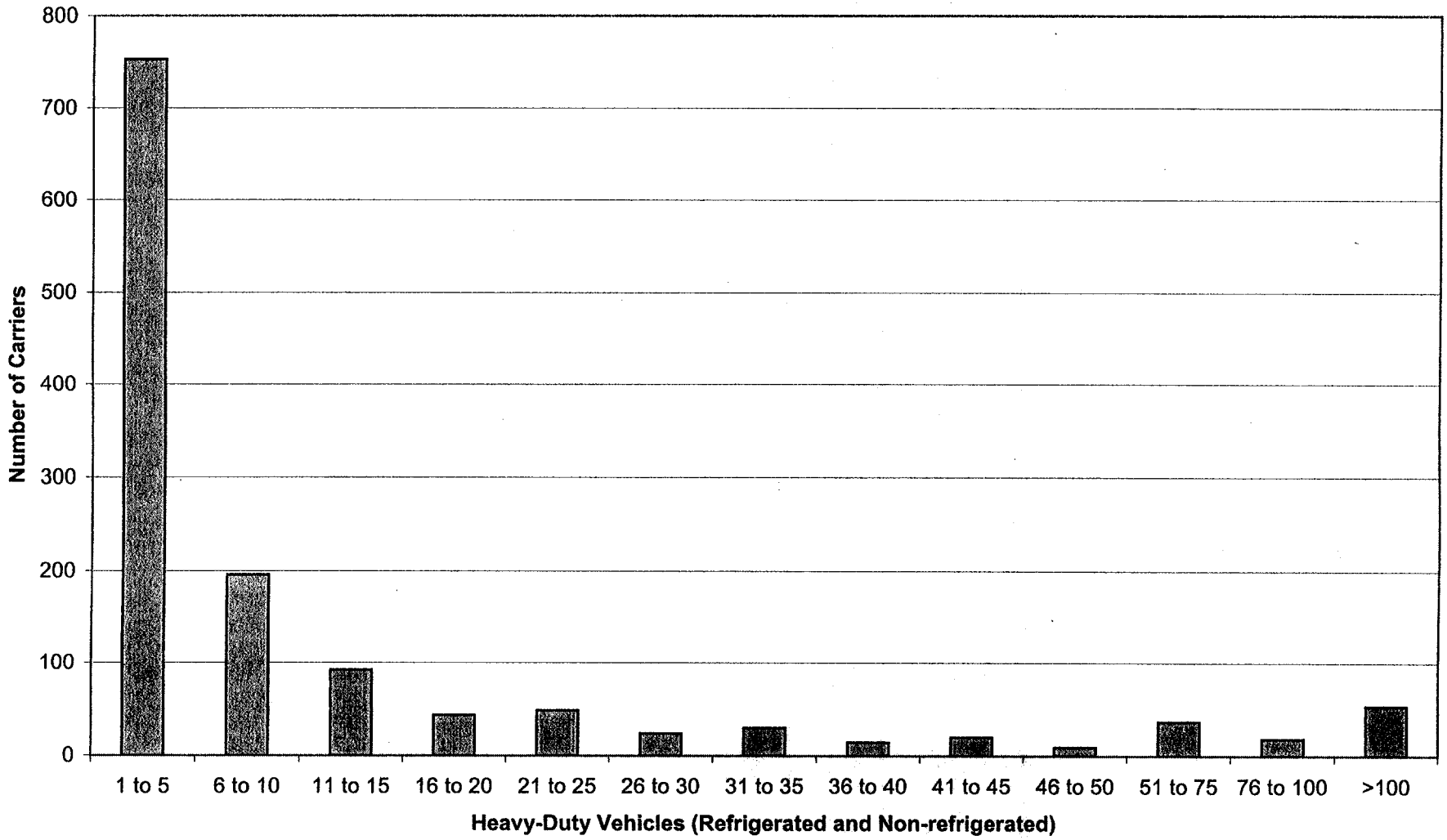
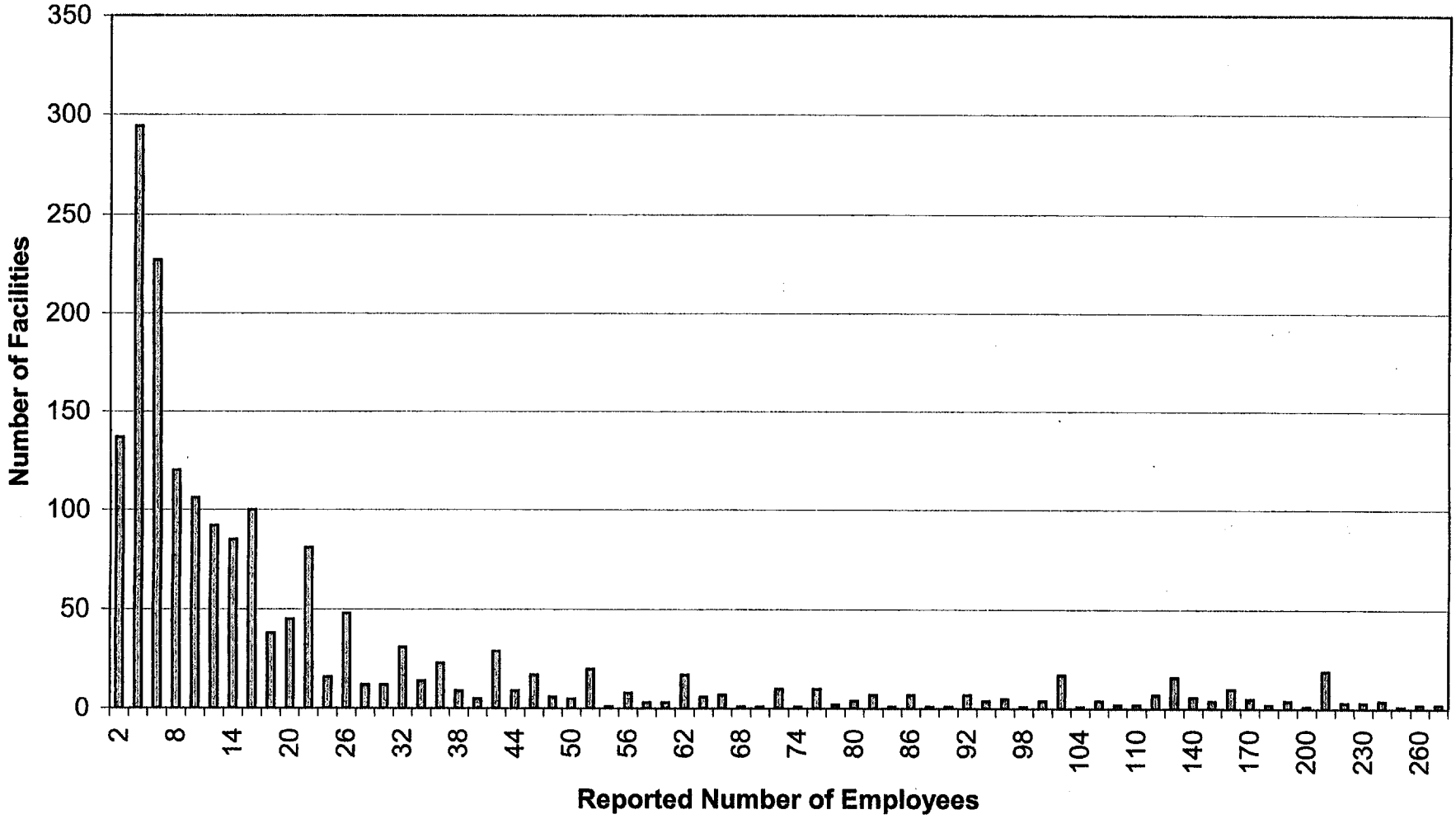


Chart 2
Number of Employees per Facility 6 (2/bin)



Source: DHS Wholesale Food Facility Database (all)

11/4/2003

APPENDIX H

GLOSSARY OF TERMS

APPENDIX H

GLOSSARY OF TERMS

AB 1807 (Tanner): [Glossary][1] A California state law (Health and Safety Code Section 39650 et seq.) which became effective in January of 1984 and established the framework for California's toxic air contaminant identification and control program.

Activity Factor: [ARB, 2003b. Preliminary Draft OFFROAD Modeling Change Technical Memo, July 18, 2003] Activity expressed in hour per year or hours per day of engine run time.

Acute Exposure: [Glossary] One or a series of short-term exposures generally lasting less than 24 hours.

Acute Health Effect: [Glossary]A health effect that occurs over a relatively short period of time (e.g., minutes or hours). The term is used to describe brief exposures and effects which appear promptly after exposure.

Additives: [DieselNet][2] Chemicals added to fuel in very small quantities to improve and maintain fuel quality and/or to lower emissions. See also "fuel additives"

Aftertreatment Devices: [DieselNet] Devices which remove pollutants from exhaust gases after the gas leaves combustion chamber (e.g., catalytic converters or diesel particulate filters). The term "exhaust gas aftertreatment" is considered derogatory by some in the emission control industry, but there is no consensus on the use of such alternatives as "post-combustion treatment" or "exhaust emission control".

Airborne Toxic Control Measure (ATCM): [Glossary] A control measure adopted by the ARB (Health and Safety Code Section 39666 et seq.), which reduces emissions of toxic air contaminants.

Air Quality Simulation Model: [Glossary] A mathematical relationship between emissions and air quality which simulates on a computer the transport, dispersion, and transformation of compounds emitted into the air.

Air Toxics: [Glossary] A generic term referring to a harmful chemical or group of chemicals in the air. Substances that are especially harmful to health, such as those considered under U.S. EPA's hazardous air pollutant program or California's AB 1807and/or AB 2588 air toxics programs, are considered to be air toxics. Technically, any compound that is in the air and has the potential to produce adverse health effects is an air toxic.

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[1] From Air Resources Board's *Glossary of Air Pollution Terms*, available at http://www.arb.ca.gov/html/gloss.htm

[2] From DieselNet's *Glossary of Terms*, available at http://www.dieselnet.com/glossary.html

Ambient Air: [Glossary] The air occurring at a particular time and place outside of structures. Often used interchangeably with "outdoor air."

American Society for Testing and Materials (ASTM): [Glossary] A nonprofit organization that provides a forum for producers, consumers, and representatives of government and industry, to write laboratory test standards for materials, products, systems, and services. ASTM publishes standard test methods, specifications, practices, guides, classifications, and terminology

Area-Wide Sources: [Glossary] Sources of pollution where the emissions are spread over a wide area, such as consumer products, fireplaces, road dust and farming operations. Area-wide sources do not include mobile sources or stationary sources.

Best Available Control Technology (BACT): [Glossary] The most up-to-date methods, systems, techniques, and production processes available to achieve the greatest feasible emission reductions for given regulated air pollutants and processes. BACT is a requirement of NSR (New Source Review) and PSD (Prevention of Significant Deterioration).

Biodiesel: [DieselNet] The mono alkyl esters of long chain fatty acids derived from renewable lipid feedstocks, such as vegetable oils and animal fats, for use in compression ignition (diesel) engines. Manufactured by transestrification of the organic feedstock by methanol.

B100 Biodiesel Fuel: [TRU][3] 100% biodiesel fuel derived from vegetable oil or animal fat and complying with ASTM D 6751-02 (or most current version) and commonly or commercially known, sold, or represented as "neat" biodiesel or B100.

Brake Power or Brake Horsepower: [ISO][4] The observed power measured at the crankshaft or its equivalent, the engine being equipped only with the standard auxiliaries necessary for its operation on the test bed.

California Air Resources Board (CARB): [Glossary] The State's lead air quality agency consisting of an eleven-member board appointed by the Governor and several hundred employees. CARB is responsible for attainment and maintenance of the state and federal air quality standards, and is fully responsible for motor vehicle pollution control. It oversees county and regional air pollution management programs.

CARB Diesel Fuel: [TRU] Any diesel fuel that meets the specifications defined in *13 CCR 2281* and *13 CCR 2282.*

Carbon Dioxide (CO2): [Glossary] A colorless, odorless gas that occurs naturally in the Earth's atmosphere. Significant quantities are also emitted into the air by fossil fuel combustion.

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[3] As defined in the proposed TRU ATCM.
[4] International Standards Organization 8178, Parts 1 and 4.

Carbon Monoxide (CO): [Glossary] A colorless, odorless gas resulting from the incomplete combustion of hydrocarbon fuels. CO interferes with the blood's ability to carry oxygen to the body's tissues and results in numerous adverse health effects. Over 80% of the CO emitted in urban areas is contributed by motor vehicles. CO is a criteria air pollutant.

Carcinogen: [Glossary] A cancer-causing substance.

Carl Moyer Fund: [Glossary] A multi-million dollar incentive grant program designed to encourage reduction of emissions from heavy-duty engines. The grants cover the additional cost of cleaner technologies for on-road, off-road, marine, locomotive and agricultural pump engines, as well as forklifts and airport ground support equipment. Note: Proposed revision would also include TRUs.

Catalyst: [Glossary] A substance that can increase or decrease the rate of a chemical reaction between the other chemical species without being consumed in the process.

Cetane Number: [DieselNet] A measure of ignition quality of diesel fuel. The higher the cetane number the easier the fuel ignites when injected into an engine. Cetane number is determined by an engine test using two reference fuel blends of known cetane numbers. The reference fuels are prepared by blending normal cetane (n-hexadecane), having a value of 100, with heptamethyl nonane, having a value of 15.

Chronic Exposure: [Glossary] Long-term exposure, usually lasting one year to a lifetime.

Chronic Health Effect: [Glossary] A health effect that occurs over a relatively long period of time (e.g., months or years).

Cloud Point (CP): [DieselNet] A measure of the ability of a diesel fuel to operate under cold weather conditions. Defined as the temperature at which wax first becomes visible when diesel fuel is cooled under standardized test conditions (ASTM D2500).

Cold Curtains: [TK][5] Flexible vinyl curtains used to reduce air exchange between the refrigerated compartment and the outside during door openings.

Cold Plate: [TK] Eutectic plate. A refrigeration unit consisting of a condenser section and several large "plates" containing a eutectic solution. Usually at night (when the vehicle is parked), the electric-powered condenser section is operated to freeze the eutectic solution in the plates. During the day, these plates absorb heat from the refrigerated compartment without reliance on an diesel engine or electric motor. (See *Eutectic Solution*)

[5] ThermoKing Corporation's "Terms of Industry"

Common Carrier: [TLI][6] A transportation company which provides service to the general public at published rates.

Compression Ignition (CI) Engine: [TRU] An internal combustion engine with operating characteristics significantly similar to the theoretical diesel combustion cycle. The regulation of power by controlling fuel supply in lieu of a throttle is indicative of a compression ignition engine.

Compressed Natural Gas (CNG): [DieselNet] Natural gas compressed to a volume and density that is practical as a portable fuel supply.

Consignee: [PONL][7] The party such as mentioned in the transport document by whom the goods, cargo or containers are to be received.

Container: [TLI] A truck trailer body that can be detached from the chassis for loading into a vessel, a rail car, or stacked in a container depot. Containers may be ventilated, insulated, refrigerated, flat rack, vehicle rack, open top, bulk liquid, or equipped with interior devices. A container may be 20 feet, 40 feet, 45 feet, 48 feet, or 50 feet in length, 8'0" or 8'6" in width, and 8'6" or 9'6" in height.

Container Number: [PONL] Identification number of a container consisting of prefix and serial number and check digit. (e.g. KNLU 123456-7)
See also: Container Serial Number and Container Prefix

Container Prefix: [PONL] A four letter code that forms the first part of a container identification number indicating the owner of a container.

Container Serial Number: [PONL] A seven digit serial number (6 plus 1 Check Digit) that forms the second part of a container identification number.

Contract Carrier: [TLI] Any person not a common carrier who, under special or individual contracts or agreements, transports passengers or property for compensation.

Cordierite: [DieselNet] A ceramic material of the formula 2MgO-2Al2O3-5SiO2 which is used for automotive flow-through catalyst substrates and ceramic wall-flow diesel filters.

Cost-Effectiveness: [Glossary] The cost of an emission control measure assessed in terms of dollars-per-pound, or dollars-per-ton, of air emissions reduced.

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[6] The Logistics Institute of the Georgia Institute of Technology's *Logistics Glossary* at http://www.tli.gatech.edu/apps/glossary/
[7] P&O Nedlloyd, *A to Z of Shipping Terms* at http://www.ponl.com/topic/home_page/about_us/useful_information/a-z_of_shipping_terms/a

Cryogenic Temperature Control System: [TK] A heating and cooling system that uses a cryogen, such as carbon dioxide or liquid nitrogen that is routed through an evaporator coil that cools air blown over the coil. The cryogenic system uses a vapor motor to drive a fan and alternator, and a propane-fired heater superheats the carbon dioxide for heating and defrosting.

Cube Out: [TLI] When a container or vessel has reached its volumetric capacity before its permitted weight limit.

Cycle Time/Cycle Factor: Percent of TRU switch-on time that the engine is running. This time varies with type of load (set point and air flow needs), ambient temperature, trailer insulation and door seal condition, number of door openings, etc. Some units operate all of the time (e.g. deep frozen ice cream or products that need continuous air flow) while others shut off when set point is reached. The cycle factor is used when only the TRU switch-on time is known to get to engine operating hours. It is not used when actual engine hours are known.

Data Logger: [TK] An electronic device that monitors and stores unit operating and temperature data for later review. Examples: DMS, DAS, DRS and AccuTrac.

Defrost: [TK] The removal of accumulated ice from an evaporator coil. Periodic defrost is necessary when the evaporator coil is operating below freezing temperature and is especially frequent when air passing through the evaporator contains high humidity.

Depot: [PONL] The place designated by the carrier where empty containers are kept in stock and received from or delivered to the container operators or merchants.

Diesel Engine: [Glossary] A type of internal combustion engine that uses low-volatility petroleum fuel and fuel injectors and initiates combustion using compression ignition (as opposed to spark ignition that is used with gasoline engines).

Diesel Oxidation Catalyst (DOC): [TRU] The use of a catalyst to promote the oxidation processes in diesel exhaust. Usually refers to an emission control device that includes a flow-through substrate where the surfaces that contact the exhaust flow have been catalyzed to reduce emissions of the organic fraction of diesel particulates, gas-phase hydrocarbons, and carbon monoxide..

Diesel Particulate Filter (DPF): [TRU] An emission control technology that reduces PM emissions by trapping the particles in a flow filter substrate. Periodically, the collected particles are either physically removed or oxidized (burned off) in a process called regeneration.

Diesel Particulate Matter (diesel PM): [TRU] The particles found in the exhaust of diesel-fueled CI engines which may agglomerate and adsorb other species to form structures of complex physical and chemical properties

Dispatch: [PONL] The process of sending goods.

Dispersion Model: [Glossary] See air quality simulation model above.

Distribution Center: [PONL] A warehouse for the receipt, the storage and the dispersal of goods among customers.

Document Holder: [PONL] Usually fastened to the door on the front of a container. May contain e.g. a certificate of approval of the container.

Dose-Response: [Glossary] The relationship between the dose of a pollutant and the response (or effect) it produces on a biological system.

Dual-Fuel Vehicle: [DieselNet] A vehicle designed to operate on a combination of alternative fuel, such as compressed natural gas (CNG) or liquefied petroleum gas (LPG), and conventional fuel, such as diesel or gasoline. These vehicles have two separate fuel systems, which inject both fuels simultaneously into the engine combustion chamber.

Economy of Scale: [PONL] A phenomenon which encourages the production of larger volumes of a commodity to reduce its unit cost by distributing fixed costs over a greater quantity.

Elemental Carbon (EC): [DieselNet] Inorganic carbon, as opposed to carbon in organic compounds, sometimes used as a surrogate measure for diesel particulate matter, especially in occupational health environments. Elemental carbon usually accounts for 40-60% of the total DPM mass.

Emission Factor: [Glossary] For stationary sources, the relationship between the amount of pollution produced and the amount of raw material processed or burned. For mobile sources, the relationship between the amount of pollution produced and the number of vehicle miles traveled. By using the emission factor of a pollutant and specific data regarding quantities of materials used by a given source, it is possible to compute emissions for the source. This approach is used in preparing an emissions inventory.

Emission Inventory: [Glossary] An estimate of the amount of pollutants emitted into the atmosphere from major mobile, stationary, area-wide, and natural source categories over a specific period of time such as a day or a year.

Emission Rate: [Glossary] The weight of a pollutant emitted per unit of time (e.g., tons/year).

Emission Standard: [Glossary] The maximum amount of a pollutant that is allowed to be discharged from a polluting source such as an automobile or smoke stack.

Environmental Justice: [Glossary] The fair treatment of people of all races and incomes with respect to development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment implies that no person or group of people should shoulder a disproportionate share of negative environmental and economic impacts resulting from the execution of environmental programs.

Epidemiology: [Glossary] The study of the occurrence and distribution of disease within a population.

Exposure: [Glossary] The concentration of the pollutant in the air multiplied by the population exposed to that concentration over a specified time period.

Exposure Assessment: [Glossary] Measurement or estimation of the magnitude, frequency, duration and route of exposure to a substance for the populations of interest.

Facility: [TRU] Any facility where TRU-equipped trucks, trailers, containers or railcars are loaded or unloaded with perishable goods. This includes, but is not limited to, grocery distribution centers, good service distribution centers, cold storage warehouses, and intermodal facilities. Each business entity at a commercial development is a separate facility (for the purposes of the proposed ATCM) provided the businesses are independently owned and operated.

Flash Point: [DieselNet] The temperature at which a combustible liquid gives off just enough vapor to produce a vapor/air mixture that will ignite when a flame is applied. The flash point is measured in a standardized apparatus using standard test methods, such as ASTM D93 or ISO 2719.

Fleet: [PONL] Any group of means of transport acting together or under one control.

Fuel Cell: [Glossary] An electrochemical cell which captures the electrical energy of a chemical reaction between fuels such as liquid hydrogen and liquid oxygen and converts it directly and continuously into the energy of a direct electrical current.

Generator Set (Gen Set): [TLI] A portable generator which can be attached to a refrigerated container to power the refrigeration unit during transit.

Health Risk Assessment (HRA): [Glossary] A document that identifies the risks and quantities of possible adverse health effects that may result from exposure to emissions of toxic air contaminants. A health risk assessment cannot predict specific health effects; it only describes the increased possibility of adverse health effects based on the best scientific information available.

"Hot Spot": [Glossary] See toxic hot spot.

Hybrid Cryogenic Temperature Control System: [TK] A temperature control system that uses a cryogenic temperature control system in conjunction with a diesel engine.

Hydrocarbons: [Glossary] Compounds containing various combinations of hydrogen and carbon atoms. They may be emitted into the air by natural sources (e.g., trees) and as a result of fossil and vegetative fuel combustion, fuel volatilization, and solvent use. Hydrocarbons are a major contributor to smog. (See also Reactive Organic Gases).

Independently Owned and Operated: [TRU] A business concern that independently manages and controls the day-to-day operations of its own business through its ownership and management, without undue influence by an outside entity or person that may have an ownership and/or financial interest in the management responsibilities of the applicant business or small business.

Indirect Source: [Glossary] Any facility, building, structure, or installation, or combination thereof, which generates or attracts mobile source activity that results in emissions of any pollutant (or precursor) for which there is a state ambient air quality standard. Examples of indirect sources include employment sites, shopping centers, sports facilities, housing developments, airports, commercial and industrial development, and parking lots and garages.

Individual Cancer Risk: [Glossary] The probability, expressed as chances in a million, that a person experiencing 70 years of continuous area-wide outdoor exposure to a toxic air contaminant will develop cancer.

Intermodal: [TLI] Used to denote movements of cargo containers interchangeably between transportation modes (i.e motor, water, and air carriers) and where the equipment is compatible within the multiple systems.

Intermodal Facility: [TRU] A facility involved in the movement of goods in one and the same loading unit or vehicle which uses successively several modes of transport without handling of the goods themselves in changing modes. Such a facility is typically involved in loading and unloading shipping containers and trailer vans to and from railcars, trucks, and ocean-going ships.

Intermodal Transport: [PONL] The movement of goods (containers) in one and the same loading unit or vehicle which uses successively several modes of transport without handling of the goods themselves in changing modes.

Internal Combustion Engine: [Glossary] An engine in which both the heat energy and the ensuing mechanical energy are produced inside the engine. Includes gas turbines, spark ignition gas, and compression ignition diesel engines.

Interruptible Service Contract: [TRU] any arrangement in which a nonresidential electrical customer agrees to reduce or consider reducing its electrical consumption during periods of peak demand or at the request of the System Operator in exchange

for compensation, or assurances not to be blacked out or other similar non-monetary assurances.

In Use (CI engine): [TRU] Not a "new" CI engine.

Lease: [PONL] A contract by which one party gives to another party the use of property or equipment, e.g. containers, for a specified time against fixed payments.

Leasing Company: [PONL] The company from which property or equipment is taken on lease.

Leasing Contract: [PONL] A contract for the leasing of property or equipment.

Lessee: [PONL] The party to whom the possession of specified property has been conveyed for a period of time in return for rental payments.

Lessor: [PONL] The party who conveys specified property to another for a period of time in return for the receipt of rent.

Liquefied Natural Gas (LNG): [DieselNet] Natural gas that has been refrigerated to cryonic temperatures where the gas condenses into a liquid.

Liquefied Petroleum Gas (LPG): [DieselNet] A mixture of low-boiling hydrocarbons that exists in a liquid state at ambient temperatures when under moderate pressures (less than 1.5 MPa or 200 psi). LPG is a by-product from the processing of natural gas and from petroleum refining. Major components of LPG are propane (min. 85% content in the U.S.), butane and propylene.

Load Factor: [ARB, 2003b. Preliminary Draft OFFROAD Modeling Technical Change Memo, July 18, 2003] The average operation level in a given application expressed as a percent of the engine manufacturer's maximum horsepower ratings.

Logistics: [TLI] That part of the supply chain process that plans, implements, and controls the efficient flow and storage of goods, services, and related information from the point of origin to the point of consumption in to meet customers' requirements.

Lubricity: [Glossary] A measure of the ability of an oil or other compound to lubricate (reduce friction) between two surfaces in contact.

Marking: [TLI] Letters, numbers, and other symbols placed on cargo packages to facilitate identification. See Shipping Marks

Mechanical Refrigeration: [U.S. Department of Agriculture Handbook 669, Revised June 2000] Refrigerant is circulated through the refrigeration system by a compressor driven by a gasoline, diesel, or electrical motor.

Mobile Sources: [Glossary] Sources of air pollution such as automobiles, motorcycles, trucks, off-road vehicles, boats, and airplanes.

Mode: [ISO] An engine operating point characterized by the speed and a torque (or an output).

Model Year (MY): [TRU] A diesel-fueled engine manufacturer's annual production period, which includes January 1st of a calendar year, or if the manufacturer has no annual production period, the calendar year.

Morbidity: [Glossary] Rate of disease incidence.

Mortality: [Glossary] Death rate.

Motor Carrier: [Based Upon 13 CCR §1201(q) and TRU]: The registered owner, lessee, or licensee of one or more straight trucks, tractors, trailers, or semi-trailers.

Mutagenic: [Glossary] The ability of a chemical or physical agent to produce heritable changes in the DNA of living cells.

Nitrogen Oxides (NOx): [Glossary] A general term pertaining to compounds of nitric oxide (NO), nitrogen dioxide (NO2), and other oxides of nitrogen. Nitrogen oxides are typically created during combustion processes, and are major contributors to smog formation and acid deposition. NO2 is a criteria air pollutant, and may result in numerous adverse health effects.

Nitric Oxide (NO): [Glossary] Precursor of ozone, NO2, and nitrate; nitric oxide is usually emitted from combustion processes. Nitric oxide is converted to nitrogen dioxide (NO2) in the atmosphere, and then becomes involved in the photochemical processes and/or particulate formation. (See Nitrogen Oxides.)

Noncarcinogenic Effects: [Glossary] Non-cancer health effects which may include birth defects, organ damage, morbidity, and death.

Non-Methane Hydrocarbon (NMHC): [Glossary] The sum of all hydrocarbon air pollutants except methane. NMHCs are significant precursors to ozone formation.

No-Observed-Adverse-Effect-Level (NOAEL): [Glossary] A term used in risk assessment. An exposure level at which there are no statistically or biologically significant increases in the frequency or severity of adverse effects between an exposed population and a comparable non-exposed population.

No-Observed-Effect-Level (NOEL): [Glossary] A term used in risk assessment. An exposure level at which there are no statistically or biologically significant difference or severity of any effect between an exposed population and a comparable non-exposed population.

Nose: [TLI] The front of a container or trailer – opposite the tail.

Office of Environmental Health Hazard Assessment (OEHHA): [Glossary] A department within the California Environmental Protection Agency that is responsible for evaluating chemicals for adverse health impacts and establishing safe exposure levels. OEHHA also assists in performing health risk assessments and developing risk assessment procedures for air quality management purposes.

Original Equipment Manufacturer (OEM): [DieselNet] Manufacturers of equipment (such as engines, vehicles, etc.) that provide the original product design and materials for its assembly and manufacture. OEMs are directly responsible for manufacturing and modifying the products, making them commercially available, and providing the warranty.

Owner/Operator: [TRU] (For the purposes of the proposed ATCM) A requirement applies to the owner and/or operator of a TRU or TRU generator set, as determined by agreement or contract if the two are separate entities.

Oxidation: [Glossary] The chemical reaction of a substance with oxygen or a reaction in which the atoms in an element lose electrons and its valence is correspondingly increased.

Ozone: [Glossary] A strong smelling, pale blue, reactive toxic chemical gas consisting of three oxygen atoms. It is a product of the photochemical process involving the sun's energy and ozone precursors, such as hydrocarbons and oxides of nitrogen. Ozone exists in the upper atmosphere ozone layer (stratospheric ozone) as well as at the Earth's surface in the troposphere (ozone). Ozone in the troposphere causes numerous adverse health effects and is a criteria air pollutant. It is a major component of smog.

Ozone Precursors: [Glossary] Chemicals such as non-methane hydrocarbons and oxides of nitrogen, occurring either naturally or as a result of human activities, which contribute to the formation of ozone, a major component of smog.

Particulate Matter (PM): [Glossary] Any material, except pure water, that exists in the solid or liquid state in the atmosphere. The size of particulate matter can vary from coarse, wind-blown dust particles to fine particle combustion products.

PM2.5: [Glossary] Includes tiny particles with an aerodynamic diameter less than or equal to a nominal 2.5 microns. This fraction of particulate matter penetrates most deeply into the lungs.

PM10 (Particulate Matter): [Glossary] A criteria air pollutant consisting of small particles with an aerodynamic diameter less than or equal to a nominal 10 microns (about 1/7 the diameter of a single human hair). Their small size allows them to make

their way to the air sacs deep within the lungs where they may be deposited and result in adverse health effects . PM10 also causes visibility reduction.

Polycyclic Aromatic Hydrocarbons (PAHs): [Glossary] Organic compounds which include only carbon and hydrogen with a fused ring structure containing at least two benzene (six-sided) rings. PAHs may also contain additional fused rings that are not six-sided. The combustion of organic substances is a common source of atmospheric PAHs.

Pour Point: [DieselNet] A measure of the ability of a diesel fuel to operate under cold weather conditions. Defined as the temperature at which the amount of wax out of solution is sufficient to gel the fuel when tested under standard conditions (ASTM D97).

Primary Particles: [Glossary] Particles that are directly emitted from combustion and fugitive dust sources. (Compare with Secondary Particle.)

Proposition 65: [Glossary] Safe Drinking and Toxic Enforcement Act of 1986, also known as Proposition 65. This Act is codified in California Health and Safety Code Section 25249.5, et seq. No person in the course of doing business shall knowingly discharge or release a chemical known to the state to cause cancer or reproductive toxicity into water or into land where such chemical passes or probably will pass into any source of drinking water, without first giving clear and reasonable warning to such individual.

Rail Car: [PONL] A wheeled wagon used for the carriage of cargo by rail.

Rated Power: [ISO] Power delivered, according to the statement of the manufacturer, at the rated speed.

Rated Speed: [ISO] Speed at which, according to the statement of the manufacturer, the rate power is delivered.

Reference Exposure Level (REL): [Glossary] A term used in risk assessment. It is the concentration at or below which no adverse health effects are anticipated for a specified exposure period.

Refrigerated Shipping Container TRU: [TRU] A shipping container equipped with a TRU.

Residual Risk: [Glossary] The quantity of health risk remaining after application of emission control.

Risk Assessment: [Glossary] An evaluation of risk which estimates the relationship between exposure to a harmful substance and the likelihood that harm will result from that exposure.

Risk Management: [Glossary] An evaluation of the need for and feasibility of reducing risk. It includes consideration of magnitude of risk, available control technologies, and economic feasibility.

Scientific Review Panel (SRP): [Glossary] Mandated by AB 1807, this nine-member panel advises the ARB, OEHHA, and the California Department of Pesticide Regulation on the scientific adequacy of the risk assessment portion of reports issued by those three agencies in the process of identifying substances as toxic air contaminants.

Secondary Particle: [Glossary] Particles that are formed in the atmosphere. Secondary particles are products of the chemical reactions between gases, such as nitrates, sulfur oxides, ammonia, and organic products.

Semi Trailer: [PONL] A vehicle without motive power and with one or more axles designed to be drawn by a truck tractor and constructed in such way that a portion of its weight and that of its load rest upon e.g. the fifth wheel of the towing vehicle.

Set Point: [TK] The temperature selected on a thermostat or microprocessor controller. This is normally the desired box temperature.

Smog: [Glossary] A combination of smoke and other particulates, ozone, hydrocarbons, nitrogen oxides, and other chemically reactive compounds which, under certain conditions of weather and sunlight, may result in a murky brown haze that causes adverse health effects . The primary source of smog in California is motor vehicles.

Shipper: [TLI] The person or company who is usually the supplier or owner of commodities shipped. Also called Consignor.

Soluble Organic Fraction (SOF): [DieselNet] The organic fraction of diesel particulates. SOF includes heavy hydrocarbons derived from the fuel and from the engine lubricating oil. The term "soluble" originates from the analytical method used to measure SOF which is based on extraction of particulate matter samples using organic solvents.

Soot: [Glossary] Very fine carbon particles that have a black appearance when emitted into the air.]

Source: [Glossary] Any place or object from which air pollutants are released. Sources that are fixed in space are stationary sources and sources that move are mobile sources.

Stakeholders: [Glossary] Citizens, environmentalists, businesses, and government representatives that have a stake or concern about how air quality is managed.

Stand-by Time [Carrier][8] Actual time that the electric standby motor operates – time when the TRU is under total electric power.

Straight Truck: [TK] A truck consisting of a driver's cab and attached box or bed for transporting cargo. Not a semi-truck which consists of a trailer pulled by a tractor.

Sulfates: [Glossary] (See Sulfur Oxides.)

Sulfur Dioxide (SO2): [Glossary] A strong smelling, colorless gas that is formed by the combustion of fossil fuels. Power plants, which may use coal or oil high in sulfur content, can be major sources of SO2. SO2 and other sulfur oxides contribute to the problem of acid deposition. SO2 is a criteria air pollutant.

Sulfur Oxides: [Glossary] Pungent, colorless gases (sulfates are solids) formed primarily by the combustion of sulfur-containing fossil fuels, especially coal and oil. Considered major air pollutants, sulfur oxides may impact human health and damage vegetation.

Switch On Time (SON): [Carrier] Total time that the unit is switched on and cooling a load. The clock keeps running even when the engine is off

Terminal: [TRU] Any place where a TRU-equipped truck, trailer, container, railcar or TRU gen set is regularly garaged, maintained, operated, or dispatched from, including a dispatch office, cross-dock facility, maintenance shop, business, or private residence.

Test Cycle: [ISO] A sequence of engine test modes each with a defined speed, torque, and weighting factor, where the weighting factors only apply if the test results are expressed in g/kWh.

Toxic Air Contaminant (TAC): [Glossary] An air pollutant, identified in regulation by the ARB, which may cause or contribute to an increase in deaths or in serious illness, or which may pose a present or potential hazard to human health. TACs are considered under a different regulatory process (California Health and Safety Code Section 39650 et seq.) than pollutants subject to CAAQSs. Health effects to TACs may occur at extremely low levels, and it is typically difficult to identify levels of exposure which do not produce adverse health effects. For more information, click here.

Toxic Hot Spot: [Glossary] A location where emissions from specific sources may expose individuals and population groups to elevated risks of adverse health effects -- including but not limited to cancer -- and contribute to the cumulative health risks of emissions from other sources in the area.

Tractor: [TLI] Unit of highway motive power used to pull one or more trailers/containers.

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[8] Provided by Carrier Transicold Corporation's Peter Guzman.

Trailer: [PONL] A vehicle without motive power, designed for the carriage of cargo and to be towed by a motor vehicle.

Transponder: [PONL] A device (chip) used for identification, which automatically transmits certain coded data when actuated by a special signal from an interrogator.

Transport: [TLI] To move cargo from one place to another.

Transport Refrigeration Unit (TRU): [TRU] Refrigeration systems powered by integral internal combustion engines designed to control the environment of temperature sensitive products that are transported in semi-trailer vans, truck vans, reefer railcars, or shipping containers. TRUs may be capable of both cooling and heating.

TRU Generator Set: [TRU] A generator set that is designed and used to provide electric power to electrically driven transport refrigeration units of any kind. This includes, but is not limited to generator sets that provide electricity to electrically powered trailer-mounted TRUs and shipping containers.

Ultra-Low-Aromatic Synthetic Diesel Fuel: [TRU] Fuel produced from natural gas by the Fischer-Tropsch gas-to-liquid chemical conversion process, or similar process that meets the following properties:

Property	ASTM	Value
Sulfur Content (ppmw)	D5453	<1
Aromatic Content (wt %)	D51876-99	1.5%
Polynuclear aromatic hydrocarbon (wt %)	-	0.5%
Cetane Number	D613	>74

Unit Risk Number: [Glossary] The number of potential excess cancer cases from a lifetime exposure to one microgram per cubic meter (µ/m3) of a given substance. For example, a unit risk value of 5.5x10-6 would indicate an estimated 5.5 cancer cases per million people exposed to an average concentration of 1 µ/m3 of a specific carcinogen for 70 years.

Verification Classification Level: [TRU] The classification assigned to a Diesel Emission Control Strategy by the Executive Officer as defined in the *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emission from Diesel Engines (13 CCR Sections 2700 – 2710).* PM reductions correspond as follows: Level 1: ≥25%; Level 2: ≥50%; Level 3: ≥85% or 0.01 g/hp-hr.

Verified Diesel Emission Control Strategy (VDECS): [TRU] An emission control strategy designed primarily for the reduction of diesel particulate matter emissions that has been verified per the *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines* (13 CCR

Sections 2700-2710). Examples of diesel retrofit systems that may be verified include, but are not limited to, diesel particulate filters, diesel oxidation catalysts, fuel additives (e.g., fuel-borne catalysts), alternative diesel fuels, and combinations of the above.

APPENDIX I

ACRONYMS

Appendix I

LIST OF ACRONYMS AND ABBREVIATIONS

$/lb	Dollars per pound
AB	Assembly bill
ARB, or the Board	Air Resources Board
ATCM	Airborne Toxic Control Measure
B100	100% biodiesel
BACT	Best available control technology
°C	Degrees Celsius
CARB	California Air Resource Board
CCR	California Code of Regulations
CHP	California Highway Patrol
CI	Compression ignition
CNG	Compressed natural gas
CO	Carbon monoxide
DECS	Diesel Emission Control System or Strategy
DOC	Diesel Oxidation Catalyst
DPF	Diesel particulate filter
DRRP, or Diesel Risk Reduction Plan	Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles Risk Reduction Plan
DFA	Department of Food and Agriculture
DHS	Department of Health Services
DTSC	Department of Toxic Substances Control
ED	Enforcement Division of ARB
EO	Executive Officer of the Air Resource Board
E/S	Electric standby
°F	Degrees Fahrenheit
FTF	Flow-through filter
g/hp-hr	Grams per horsepower-hour
>	Greater than
HC	Hydrocarbon
H&SC	Health and Safety Code
<	Less than
LETRU	Low Emissions Transport Refrigeration Unit
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
Low sulfur diesel fuel	Diesel fuel with less than 15 ppmw sulfur content
$\mu g/m^3$	Microgram per cubic meter
MY	Model year
Moyer Program	Carl Moyer Memorial Air Quality Standards Attainment Program
NMHC	Non-methane hydrocarbons
NO	Nitrogen oxide
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen

NOV	Notice of violation
OEHHA	Office of Environmental Health Hazard Assessment
O & M	Operation and maintenance
PM	Particulate matter
ppmw	Parts per million by weight
PTSD	Planning and Technical Support Division of ARB
SCAQMD	South Coast Air Quality Management District
SJVAPCD	San Joaquin Air Pollution Control District
SSD	Stationary Source Division of ARB
TAC	Toxic air contaminant
tpd	Tons per day
TRU	Transport Refrigeration Unit
ULETRU	Ultra-Low Emission Transport Refrigeration Unit
USDA	United States Department of Agriculture
U. S. EPA	United States Environmental Protection Agency
VDECS	Verified Diesel Emission Control Strategy
VIN	Vehicle identification number
VOC	Volatile organic carbon

APPENDIX J

ACTIVITY ANALYSIS OF TRANSPORT REFRIGERATION UNITS

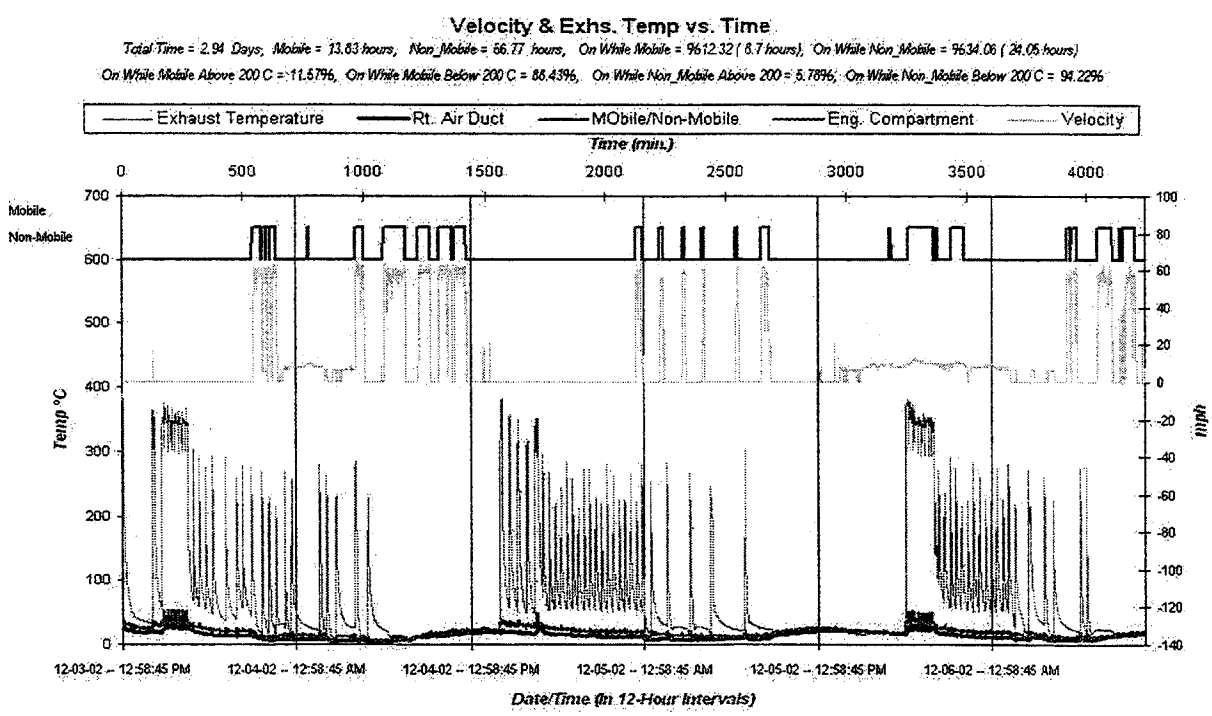
ACTIVITY ANALYSIS OF TRANSPORT REFRIGERATION UNITS

This project was conducted by the University of California - Riverside, College of Engineering Center for Environmental Research and Technology. The final report for this project had not been completed as of the publication of the staff report for the proposed TRU ATCM. The purpose of the project was to study diesel engines that are used in transport refrigeration units (TRUs). The primary objective was to characterize duty cycles and operating parameters of diesel-powered TRUs operated in assorted real-world applications.

To achieve that goal, UCR worked with several companies that allowed them to put data loggers on their operating units. Twenty-seven trailer TRUs were monitored while delivering a variety of goods over inter and intra-city routes from an egg distribution company, a grocery distribution company, and a wholesale restaurant supply company. The data loggers recorded the exhaust temperature of the TRU as well as the temperature in the refrigerated compartment as a function of time. An overlay of the global positioning system (GPS) data as a function of time allowed an analysis of whether emissions occurred while the TRU was on the road, or the TRU was stationary and presumably in a distribution center. From these data the cumulative time that the exhaust temperature spent as a function of temperature was calculated to help choose suitable control technology.

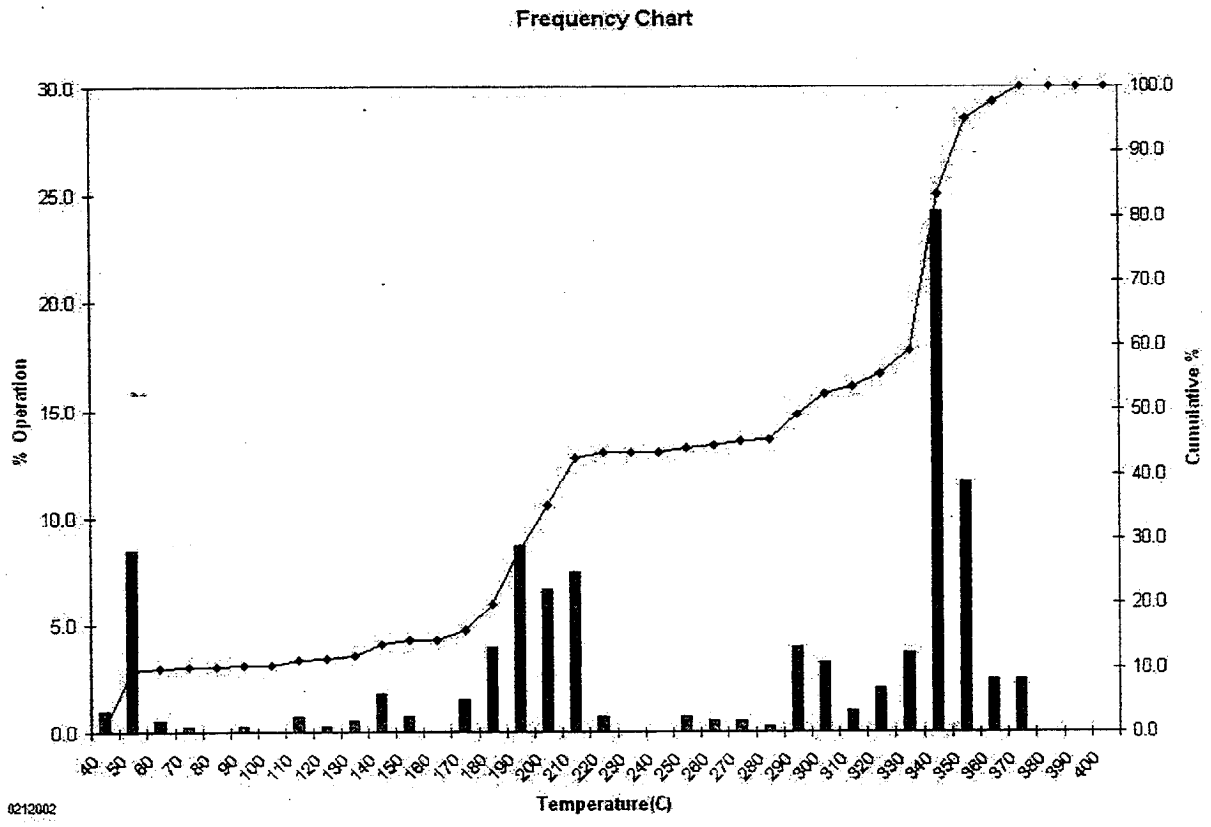
An example of the time series plots for a data logger output is show in Figure J-1, below. Results show that the units spent most of their operating time while stationary and presumably at the distribution center.

Figure J-1



The frequency distribution of the exhaust temperatures shown in Figure J-1 is shown in Figure J-2.

Figure J-2



TITLE 13. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER AMENDMENTS TO THE VERIFICATION PROCEDURE, WARRANTY AND IN-USE COMPLIANCE REQUIREMENTS FOR IN-USE STRATEGIES TO CONTROL EMISSIONS FROM DIESEL ENGINES

The Air Resources Board (the Board or ARB) will conduct a public hearing at the time and place noted below to consider amendments to the Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines.

DATE: December 11, 2003

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Central Valley Auditorium
1001 "I" Street
Sacramento, CA 95814

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., December 11, 2003, and may continue at 8:30 a.m., December 12, 2003. This item may not be considered until December 12, 2003. Please consult the agenda for the meeting, which will be available at least 10 days before December 11, 2003, to determine the day on which this item will be considered.

If you have special accommodation or language needs, please contact the ARB's Clerk of the Board at (916) 322-5594 or sdorais@arb.ca.gov as soon as possible. TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed amendments to sections 2701, 2702, 2703, 2704, 2705, 2706, and 2707, title 13, California Code of Regulations (CCR).

Background: In 1998 the Air Resources Board (ARB or Board) identified diesel particulate matter emissions from diesel-fueled engines as a toxic air contaminant (title 17, CCR, section 93000). The ARB adopted the Diesel Risk Reduction Plan (DRRP or Plan) in 2000, which established a goal of reducing emissions and the resultant health risk from virtually all diesel-fueled engines and vehicles within the State of California by the year 2020. The Plan envisioned that

diesel particulate matter emissions should be reduced by 75 percent in 2010 and 85 percent in 2020. To achieve those goals, the Plan identified various methods including more stringent standards for all new diesel-fueled engines and vehicles, the use of diesel emission control strategies on in-use engines, and the use of low-sulfur diesel fuel.

To carry out the component of the DRRP that concerns implementation of in-use emission control strategies, ARB staff developed a procedure to verify emissions reductions achieved by strategies, which also includes warranty and in-use compliance requirements (the Procedure). The Board approved the Procedure at the May 16, 2002 public hearing with various modifications. The modifications to the Procedure were distributed with the Notice of Public Availability of Modified Text, released on January 29, 2003. The modifications and the rationale behind them are described in that notice.

Both during and after the periods of public comment, staff has maintained a dialogue with stakeholders. As a result of this on-going dialogue, staff determined that changes could be made to improve the Procedure and better enable ARB to meet the goals of the Plan. The proposed changes are briefly described in the next section.

Proposed Amendments: Summarized below are the four most significant proposed amendments to the Procedure. Additional proposed amendments include minor definitional changes and clarifications, which are shown in the Initial Statement of Reasons and the attachments thereto.

(1) Warranty requirements: In developing the warranty requirements for verification, staff tried to strike a balance between the interests of the end-users and the manufacturers of emission control systems. Sometimes, the views of the two groups can seem to be almost diametrically opposed. Nevertheless, staff recognizes that it is imperative that Californians' exposure to diesel particulate matter be reduced to the greatest extent possible and that a viable warranty is necessary to achieve this goal. Achieving this goal is in jeopardy because the manufacturers of diesel emissions control strategies perceive that the current warranty requirement presents them with too great a liability to participate in the verification process, and end-users perceive it as providing insufficient consumer protection.

Subsequent to the approval of the Procedure by the Board, manufacturers of diesel emission control strategies began voicing significant concerns to staff regarding the Procedure's warranty requirements. Although manufacturers' concerns over the warranty were lessened by various clarifications made by staff, they were not completely resolved. Full resolution will require that the Board consider amendments to the Procedure. The mandatory warranty for verified diesel emission control systems currently includes coverage of damage to the engine and vehicle or equipment that is proximately caused

by the control system. It is primarily the inclusion of the vehicle or equipment in the warranty coverage that has prevented manufacturers of emission control systems from agreeing to participate in the verification process. Their primary concern is the potential for end-users to make spurious claims with the goal of obtaining new vehicles or equipment.

The California Trucking Association (CTA), representing end-users, has repeatedly stated that the duration of warranty coverage is insufficient. Even if coverage of vehicle/equipment damage is removed, staff points out that the warranty affords far more protection than that required under the United States Environmental Protection Agency's (U.S. EPA) Urban Bus Retrofit/Rebuild program, which was another mandatory emission control effort directed at in-use fleets. As with warranties offered by engine manufacturers, the U.S. EPA's required warranty did not include coverage of vehicle/equipment damage. In addition, it has been staff's experience that the potential for a verified emission control strategy to cause non-engine related damage is minimal. In the unlikely event that such damage should occur, however, all the standard avenues for relief from secondary damages remain intact. Therefore, even without coverage of vehicle/equipment damage, staff does not believe that end-users would be left without relief. Moreover, there will be no cost impacts associated with the proposed amendment.

In an effort to achieve the goals of the DRRP while still maintaining a reasonable degree of consumer protection, staff therefore proposes that mandatory warranty coverage extend only to the engine, and not to the vehicle or equipment with which the control system is used.

(2) <u>NO_2 Limit</u>: Another component of the Procedure in need of amendment relates to the nitrogen dioxide (NO_2) emission limit. The Procedure currently states that beginning on January 1, 2004, post-control NO_2 emissions from an engine using a diesel emission control strategy must not exceed 20 percent of the total baseline (pre-control) NOx emissions. After that date, systems that do not meet the limit will not be verified and may not be installed. At present, the effective date is only months away and no Level 3 systems have been verified that meet the NO_2 limit. Therefore, unless new compliant systems are verified soon, California stands to lose valuable early field experience and PM reductions that can be gained prior to the implementation of proposed rules that would require installation of a verified diesel emission control strategy on certain vehicle fleets. Furthermore, significant questions have arisen surrounding the accuracy of the assumptions that led to selection of the 20 percent limit and the nature of engine-out NO_2 emissions. For those reasons, staff proposes that the effective date of the NO_2 limit be changed from January 1, 2004 to January 1, 2007. The three-year delay should give staff the time it needs to gather additional data and develop a better understanding of the questions

surrounding the NO_2 issue. It will also give manufacturers more time for product development aimed at reducing NO_2 emissions. To prevent possible negative side-effects of higher NO_2 emissions, the delay ends before widespread implementation of diesel emission control strategies is expected to occur. The delay also eliminates the potential for economic impact arising from the amendments.

(3) Proposed Verification Testing Protocol: Section 2702(b) of the Procedure describes the requirements for the Proposed Verification Testing Protocol that the applicant must prepare. One of the subsections of the protocol requires that the applicant describe its system's principles of operation. Staff must develop a good understanding of the system for several reasons, principal among them being the need to determine whether additional analyses for other harmful pollutants are necessary. The Procedure currently lacks a formal process for handling those control systems that appear to rely on principles not generally understood or accepted by the scientific world. To fill that need, staff proposes that the applicant must demonstrate that its product relies on sound principles of science and engineering to achieve emission reductions. If the Executive Officer determines that the applicant has not made a satisfactory demonstration after two attempts, the application may be suspended. If an application has been suspended, it may only be reactivated at the discretion of the Executive Officer. Staff also proposes that if at any point in the verification process the Executive Officer has reason to doubt the scientific or engineering soundness of a product, the Executive Officer can require the applicant to provide further substantiation or risk suspension of the application or revocation of an existing verification.

(4) Harmonization of Durability Requirements: The Procedure requires that the applicant conduct emission reduction testing with the diesel emission control strategy both before and after the service accumulation period. The verification protocol used to support the U.S. EPA Voluntary Diesel Retrofit Program calls for testing of both a pre-conditioned (or "de-greened") unit and an aged unit at the same point in time, with testing of a single unit at two different times (before and after service accumulation) left as an option. The primary advantages of the first option are that it reduces the cost of testing and minimizes test condition variability to the extent that the two units are indeed identical. To further harmonize with U.S. EPA's program and to offer more flexibility to applicants, staff proposes that the applicant be allowed to request that the Executive Officer consider the testing of two identical units, one that has been pre-conditioned and another that has completed the service accumulation period. In reviewing the request, the Executive Officer may consider all relevant information, such as whether a system causes any changes in engine operation over time and the quality of the evidence the applicant can provide to support that the two units are identical.

COMPARABLE FEDERAL REGULATIONS

The U.S. EPA has published a draft document, "General Verification Protocol for Diesel Exhaust Catalysts, Particulate Filters, and Engine Modification Control Technologies for Highway and Nonroad Use Diesel Engines," but has not promulgated formal regulations for this verification protocol. This verification protocol is intended to support the voluntary retrofit programs initiated by the U.S. EPA, while the staff's proposal is to support the ARB's Diesel Risk Reduction Plan.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

The ARB staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes a summary of the environmental and economic impacts of the proposal.

Copies of the ISOR and the full text of the proposed regulatory language may be accessed on ARB's web site listed below, or may be obtained from ARB's Public Information Office, Environmental Services Center, 1001 "I" Street, First Floor, Sacramento, CA 95814, (916) 322-2990, at least 45 days prior to the scheduled hearing (December 11, 2003).

Upon its completion, the Final Statement of Reasons (FSOR) will also be available and copies may be requested from the agency contact persons in this notice, or may be accessed on the web site listed below.

Inquiries concerning the substance of the proposed amendments may be directed to the designated agency contact persons, Mr. Paul Henderick, Air Resources Engineer, Retrofit Assessment Section, at (626) 350-6440, or Mr. Scott Rowland, Manager, Retrofit Assessment Section, at (626) 575-6972.

Further, the agency representative and designated back-up contact persons to whom non-substantive inquiries concerning the proposed administrative action may be directed are Artavia Edwards, Manager, Board Administration & Regulatory Coordination Unit, (916) 322-6070, or Amy Whiting, Regulations Coordinator, (916) 322-6533. The Board staff has compiled a record for this rulemaking action, which includes all information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

If you are a person with a disability and desire to obtain this document in an alternative format, please contact the ARB's Clerk of the Board at (916) 322-5594 or sdorais@arb.ca.gov as soon as possible. TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

This notice, the ISOR, and all subsequent regulatory documents, including the FSOR when completed, will be available on the ARB Internet site for this rulemaking at http://www.arb.ca.gov/regact/verpro03/verpro03.htm.

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies, private persons and businesses in reasonable compliance with the proposed regulations are presented below.

Pursuant to Government Code sections 11346.5(a)(5) and 11346.5(a)(6), the Executive Officer has determined that the proposed regulatory action will not create costs or savings, to any state agency or in federal funding to the State, costs or mandate to any local agency or school district whether or not reimbursable by the State pursuant to part 7 (commencing with section 17500), division 4, title 2 of the Government Code, or other non-discretionary savings to State or local agencies.

In developing this regulatory proposal, ARB staff evaluated the potential economic impacts on representative private persons or businesses. The ARB is not aware of any cost impacts that a representative private person or business would necessarily incur in reasonable compliance with the proposed action.

The Executive Officer has made an initial determination that the proposed regulatory action will not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or businesses directly affected.

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed regulatory action will not affect the creation or elimination of jobs within the State of California, the creation of new businesses or elimination of existing businesses within California, or the expansion of businesses currently doing business within California. An assessment of the economic impacts of the proposed regulatory action can be found in the ISOR.

The Executive Officer has also determined, pursuant to Government Code section 11346.5(a)(3)(B), that the proposed regulatory action will not affect small businesses because participation in the Procedure is purely voluntary with respect to any business. There are no cost impacts that a representative private person or business would necessarily incur in reasonable compliance with the proposed action.

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the ARB's Executive Officer has found that the reporting requirements of the

regulation which apply to businesses are necessary for the health, safety, and welfare of the people of the State of California.

Before taking final action on the proposed regulatory action, the Board must determine that no alternative considered by the agency would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action.

SUBMITTAL OF COMMENTS

The public may present comments relating to this matter orally or in writing at the hearing, and in writing or by e-mail before the hearing. To be considered by the Board, written submissions must be received by **no later than 12:00 noon, December 10, 2003** and addressed to the following:

Postal Mail is to be sent to:

Clerk of the Board
Air Resources Board
1001 "I" Street, 23rd Floor
Sacramento, California 95814

Electronic mail is to be sent to: verpro03@listserv.arb.ca.gov and received at the ARB **no later than 12:00 noon, December 10, 2003.**

Facsimile submissions are to be transmitted to the Clerk of the Board at (916) 322-3928 and received at the ARB **no later than 12:00 noon, December 10, 2003**.

The Board requests, but does not require, that 30 copies of any written statement be submitted at least 10 days prior to the hearing so that ARB staff and Board Members have time to fully consider each comment. The ARB encourages members of the public to bring to the attention of the staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under that authority granted in sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, and 43105, 43600, 43700 of the Health and Safety Code. This action is proposed to implement, interpret and make specific sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, and 43204-43205.5 of the Health and Safety Code and Title 17 California Code of Regulations section 93000.

HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340) of the Government Code.

Following the public hearing, the Board may adopt the regulatory language as originally proposed, or with non-substantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice that the regulatory language as modified could result from the proposed regulatory action; in such event the full regulatory text, with the modifications clearly indicated, will be made available to the public, for written comment, at least 15 days before it is adopted.

The public may request a copy of the modified regulatory text from the Board's Public Information Office, 1001 "I" Street, Sacramento, CA 95814, (916) 322-2990.

CALIFORNIA AIR RESOURCES BOARD

Catherine Witherspoon
Executive Officer

Date: October 14, 2003

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs see our Web-site at www.arb.ca.gov.

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS

PROPOSED AMENDMENTS TO THE VERIFICATION PROCEDURE FOR IN-USE STRATEGIES TO CONTROL EMISSIONS FROM DIESEL ENGINES

Date of Release: October 24, 2003
Scheduled for Consideration: December 11-12, 2003

This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

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APPENDIX A. PROPOSED REGULATION ORDER

FIGURES

Figure 1 DPF NO_2 Fractions by Test Cycle 17

Figure 2 DPF NO_2 Fractions by Engine Series 17

EXECUTIVE SUMMARY

In 1998, the Air Resources Board (ARB or "Board") identified diesel particulate matter (PM) as a toxic air contaminant. Because of the amount of diesel PM emitted into California's air, it is now by far the number one contributor to the total health risk posed by toxic substances in the ambient air. To address this large-scale health concern, the ARB adopted the Diesel Risk Reduction Plan in 2000. A significant component of the Diesel Risk Reduction Plan involves proposals to apply emission control strategies to in-use diesel vehicles and equipment. To ensure that any technology used toward that end would achieve real and durable emission reductions, staff developed the Diesel Emission Control Strategy Verification Procedure (the "Procedure"), which was adopted by the Board in May 2002.

Since the adoption of the Procedure, staff has identified four primary areas that require amendments:

(1) Warranty requirements: In developing the warranty requirements for verification, staff tried to strike a balance between the interests of the end-users and the manufacturers of emission control systems. Sometimes, the views of the two groups can seem to be almost diametrically opposed. Nevertheless, staff recognizes that it is imperative that Californians' exposure to diesel particulate matter be reduced to the greatest extent possible, and that a viable warranty is necessary to achieve this goal. Achieving this goal is in jeopardy because the manufacturers of diesel emissions control strategies perceive that the current warranty requirement presents them with too great a liability to participate in the verification process, and end-users perceive it as providing insufficient consumer protection.

Subsequent to the adoption of the Procedure by the Board, manufacturers of diesel emission control strategies began voicing significant concerns to staff regarding the Procedure's warranty requirements. Although manufacturers' concerns over the warranty were lessened by various clarifications made by staff, they were not completely resolved. Full resolution will require that the Board consider amendments to the Procedure. The mandatory warranty for verified diesel emission control systems currently includes coverage of damage to the engine and vehicle or equipment that is proximately caused by the control system. It is primarily the inclusion of the vehicle or equipment in the warranty coverage that has prevented manufacturers of emission control systems from agreeing to participate in the verification process. Their primary concern is the potential for end-users to make spurious claims with the goal of obtaining new vehicles or equipment.

The California Trucking Association (CTA), representing end-users, has repeatedly stated that the duration of warranty coverage is insufficient. Even if coverage of vehicle/equipment damage is removed, staff points out that the warranty affords far more protection than that required under the United States Environmental

Protection Agency's (U.S. EPA) Urban Bus Retrofit/Rebuild program, which was another mandatory emission control effort directed at in-use fleets. As with warranties offered by engine manufacturers, the U.S. EPA's required warranty did not include coverage of vehicle/equipment damage. In addition, it has been staff's experience that the potential for a verified emission control strategy to cause non-engine related damage is minimal. In the unlikely event that such damage should occur, however, all the standard avenues for relief from secondary damages remain intact. Therefore, even without coverage of vehicle/equipment damage, staff does not believe that end-users would be left in an unreasonable situation.

In an effort to achieve the goals of the Diesel Risk Reduction Plan while still maintaining reasonable consumer protection, staff therefore proposes that mandatory warranty coverage extend only to the engine, and not to the vehicle or equipment with which the control system is used.

(2) Nitrogen dioxide (NO_2) emission limit: The Procedure states that post-control NO_2 emissions must not exceed 20 percent of the total baseline (pre-control) NOx emissions. That NO_2 limit becomes effective on January 1, 2004. Staff proposes that the effective date be changed to January 1, 2007, to provide time to re-evaluate the limit and to allow implementation of effective emission controls to continue in the near-term. Re-evaluation of the limit is advised, as questions have arisen concerning the appropriateness of the limit given new information on the expected fleet penetration of high-NO_2 systems and the nature of NO_2 emissions in general. The delay ends before staff expects large-scale implementation of emission control systems, and therefore prevents negative regional health effects.

(3) Proposed verification testing protocol: An early step in the verification process that applicants must take is the preparation of the Proposed Verification Testing Protocol. One of the subsections of the proposed protocol requires that the applicant describe its system's principles of operation. Staff must develop a good understanding of the system for several reasons, principal among them being the need to determine whether additional analyses for other harmful pollutants are necessary. Staff proposes adding language to that subsection which clarifies how staff is to handle those control systems that appear to rely on principles not generally understood or accepted by the scientific world. The proposed language gives the applicant two opportunities to demonstrate that its product relies on sound principles of science and engineering to achieve emission reductions. After review of the second submittal, the Executive Officer may determine to either continue the verification process or to suspend the application or revoke an existing verification.

(4) Harmonization of Durability Requirements: The fourth major proposed amendment is born of an on-going effort to harmonize the Procedure with the U.S. EPA's verification protocol. The Procedure requires that emission reduction testing for a diesel emission control strategy be performed before and after the service accumulation period. As an alternative to testing a single unit in that fashion, staff proposes that the applicant be allowed to request that staff consider the testing of

two identical units, one that has been pre-conditioned and another that has completed the service accumulation period. That testing option is consistent with the requirements in the U.S. EPA's verification protocol.

Additional proposed amendments of a more minor nature include: (1) definitional changes and additions for consistency with the proposed Airborne Toxic Control Measure to Reduce Diesel Particulate Matter Emissions from Stationary Diesel-Fueled Compression Ignition Engines, (2) clarification of test cycle selection for off-road and stationary engine testing, (3) clarification that the Executive Officer will consider test procedures specified in airborne toxic control measures when evaluating a request to use an alternative test cycle or method, and (4) correction of the procedure for measuring NO_2.

Because no direct emissions benefits are associated with the staff proposal, no traditional cost effectiveness can be calculated. When staff proposes rules to implement in-use controls for the various categories of diesel engines, it will provide more detailed estimates, taking into account the specific issues associated with each category. Staff's proposed amendments do not change the voluntary nature of the Procedure. Accordingly, there will be economic impacts only with those individuals that choose to follow the Procedure to verify their products.

The proposed amendments to the Procedure retain the sound guidelines for evaluation and the flexibility of the original Procedure that are needed to reduce the burden on applicants and allow speedy implementation of the Diesel Risk Reduction Plan. The ARB staff recommends that the Board adopt the proposed amendments to sections of 2700 to 2710, Title 13, California Code of Regulations, set forth in the proposed Regulation Order in Appendix A.

1 INTRODUCTION

This report, written by the staff of the Air Resources Board (ARB or "Board"), describes proposed amendments to the Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines (the "Procedure"), which is in the California Code of Regulations, Title 13, Sections 2700-2710. The primary purpose of the Procedure is to support California's Diesel Risk Reduction Plan (see Section 2), which aims to dramatically reduce Californians' exposure to diesel particulate matter (PM). Verification under the Procedure is the key to gaining recognition of emissions benefits and thus to participating in the diesel emission control market created by the Diesel Risk Reduction Plan. The Procedure contains emission testing requirements that manufacturers of emission control technologies must fulfill in order for their products to be verified, as well as warranty and in-use compliance testing requirements. Since the Procedure was adopted by the Board in May 2002, staff has determined that changes could be made to improve the Procedure and better enable ARB to meet the goals of the Diesel Risk Reduction Plan. This report describes those changes and the rationale behind them.

Section 2 of the report provides context and historical background on the Procedure. The amendments staff is proposing are briefly summarized in Section 3, and Section 4 discusses the rationale used by staff in arriving at those proposals. Staff discusses how the proposal affects interaction of the Procedure with other ARB diesel programs in Section 5, and describes potential issues of controversy in Section 6. A number of regulatory alternatives to what staff proposes are covered in Section 7. Staff discusses the economic impacts of the proposed amendments on the public and private sectors in Section 8, and environmental impacts in Section 9. After briefly addressing cost-effectiveness in Section 10, staff concludes the report with Section 11.

2 BACKGROUND

In 1998, the ARB identified diesel PM as a toxic air contaminant following a ten-year review process. A toxic air contaminant is an air pollutant that contributes to mortality or serious illness, or poses other potential hazards to human health. Most toxic air contaminants are volatile and are found primarily in the atmosphere as gases, but some are atmospheric particles or liquid droplets. Diesel PM is of particular concern because it can be distributed over large regions, thus creating widespread public exposure.

Because of the amount of diesel PM emitted into California's air, it is by far the number one toxic air contaminant. To address this large-scale health concern, the ARB adopted the Diesel Risk Reduction Plan in 2000 (ARB, 2000). One of the primary goals of the Diesel Risk Reduction Plan is to reduce emissions of diesel PM from the long-lived in-use fleet. The Plan outlines measures that include the use of diesel emission control strategies with existing diesel vehicles and equipment in on-road, off-road, and stationary applications. To be able to implement those measures, ARB must first verify that candidate emission control technologies are effective in reducing emissions.

In response to that requirement, ARB staff developed a procedure to verify strategies that provide real and durable reductions in diesel PM emissions. The Board adopted the Procedure at the public hearing held on May 16, 2002. Although the primary function of the Procedure is to support the Diesel Risk Reduction Plan, it also quantifies NOx reductions in light of California's persistent ozone problem. The Procedure encompasses on-road, off-road, and stationary applications and is designed to evaluate a broad range of technologies, including aftertreatment systems, alternative diesel fuels, and fuel additives. The Procedure represents a cooperative inter-divisional effort that drew upon the expertise of staff in different areas as needed. Staff also worked with and continues to work with the U.S. EPA on harmonizing the verification procedures between the two agencies.

The requirements for verification under the Procedure extend beyond conducting emissions testing to quantify emissions reductions. The Procedure classifies technologies based on their PM reductions as Level 1 (25 percent minimum reduction), Level 2 (50 percent minimum reduction), or Level 3 (85 percent minimum reduction or maximum emission rate of 0.01 grams per brakehorsepower-hour). A technology must achieve at least a Level 1 PM reduction to be verified. To ensure that a product's emission reductions are durable, verification requires that applicants conduct emissions testing after the product has accumulated a specified amount of service in the field or in a laboratory. Applicants must also offer a specified minimum warranty to protect consumers against defects. Last, applicants must both conduct and successfully pass in-use compliance testing for their products to retain their verified status. Thus, the Procedure aims to ensure real and durable emission reductions, acknowledges consumers' interests, and requires that systems sold in the marketplace perform as well as those used for verification testing.

Staff has maintained a dialogue with stakeholders before, during, and after workshops and periods of public comment. As a result of this on-going dialogue, staff determined that changes could be made to improve the Procedure and better enable ARB to meet the Diesel Risk Reduction Plan's goal to dramatically reduce public exposure to diesel particulate matter. The proposed changes are briefly summarized in the next section and discussed in more detail in Section 4.

3 SUMMARY OF PROPOSED AMENDMENTS

The following is a concise summary of staff's proposed amendments to the Diesel Emission Control Strategy Verification Procedure. Section 4 discusses the proposals and explains the rationale behind them.

3.1 Warranty Requirements

The mandatory warranty for verified diesel emission control systems currently includes coverage of damage to the engine and vehicle or equipment proximately caused by the

control system. Staff proposes that warranty coverage only extend to the engine, and not the vehicle or equipment with which the control system is used.

3.2 NO_2 Limit

The Procedure states that post-control NO_2 emissions must not exceed 20 percent of the total baseline (pre-control) NOx emissions on a mass basis. That NO_2 limit becomes effective on January 1, 2004. Staff proposes that the effective date be changed to January 1, 2007.

3.3 Proposed Verification Testing Protocol

Section 2702(b) of the Procedure describes the requirements for the Proposed Verification Testing Protocol that the applicant must prepare. One of the subsections of the proposed protocol requires that the applicant describe its system's principles of operation. Staff proposes adding language to that subsection which relates to those control systems that appear to rely on principles not generally understood or accepted by the scientific world. The proposed language states that it is the responsibility on the applicant to demonstrate that its product relies on sound principles of science and engineering to achieve emission reductions. If, after reviewing the proposed protocol, the Executive Officer determines that the applicant has not made a satisfactory demonstration, staff proposes that the applicant be given a second opportunity (60 days) to submit additional material and clarifications that explain the principles of operation. After review of the second submittal, the Executive Officer may determine to either continue the verification process or to suspend the application. If an application has been suspended, it may only be reactivated at the discretion of the Executive Officer. Staff also proposes that if at any point in the verification process the Executive Officer has reason to doubt the scientific or engineering soundness of a product, the Executive Officer can require the applicant to provide further substantiation or risk suspension of the application or revocation of an existing verification.

In addition to the above, staff proposes adding another section to the proposed protocol in which the applicant simply states that the applicant agrees to provide a warranty pursuant to the requirements in the Procedure.

3.4 Harmonization of Durability Requirements

The Procedure requires that emission reduction testing for a diesel emission control strategy be performed before and after the service accumulation period. As an alternative to testing a single unit in that fashion, staff proposes that the applicant be allowed to request that staff consider the testing of two identical units, one that has been pre-conditioned and another that has completed the service accumulation period. The testing of two such units is consistent with U.S. EPA's verification procedure. In reviewing the request, staff may consider all relevant information, such as:

- The effect of the system on engine operation over time. Systems that cause changes in engine operation are likely not to qualify for this testing option.
- The quality of the evidence the applicant can provide to support that the two units are identical.

- Previous experience with similar or related technologies.
- Whether the applicant is participating in the U.S. EPA verification process and has made an agreement with U.S. EPA to test two units.

3.5 Additional Proposed Amendments

Definitions: Staff added the definitions for the terms "Emergency Use " and "ALSF-1 and ALSF-2" and modified the definitions of the terms "Emergency Standby Engine," "Portable Diesel Engine," and "Stationary Diesel Engine."

Off-road and Stationary Engine Test Requirements: Staff clarified that the off-road diesel engine regulations referred to in subsections 2703(e)(2) and (3) require the use of a specific test cycle, but that applicants may nevertheless request the Executive Officer to consider alternatives.

Alternative Test Cycles and Methods: Section 2703(f) lists examples of items that the Executive Officer may consider when evaluating an applicant's request to use an alternative test cycle or method. To that list, staff added test procedures specified in airborne toxic control measures (ATCMs) adopted by the ARB.

Procedure for Measuring NO_2: Section 2706(a)(3) indicates that part of the NO_2 calculation involves subtracting NO from NOx on a second-by-second basis. Staff corrected that procedure by indicating that NO_2 is to be determined by subtracting the average rather than second-by-second values.

Limits on Other Pollutants: Section 2706(b) specifies that verified diesel emission control strategies must not increase the emissions of carbon monoxide (CO) greater than the current CO emission standards for new diesel engines. Staff amended this requirement for stationary engine applications. For stationary applications, the diesel emission control strategy must not result in an increase in the emissions of CO by more than 10 percent above baseline levels.

4 DISCUSSION

This section of the report includes a more detailed discussion of the proposed amendments and the reasoning staff used in their development.

4.1 Warranty Requirements

In developing the warranty requirements for verification, staff has had to strike a balance between the needs of end-users and manufacturers of emission control systems. As can be expected, the views of the two groups are almost diametrically opposed. Nevertheless, staff recognizes that it is imperative that Californians' exposure to diesel particulate matter be reduced to the greatest extent possible. Achievement of that goal is currently in jeopardy because manufacturers perceive the warranty presents them with too great a liability to participate, and end-users perceive it as providing insufficient consumer protection.

Subsequent to the adoption of the Procedure in May 2002, diesel emission control strategy manufacturers began strongly voicing concerns with the warranty requirements, in particular with the extent of liability. Staff commenced working with manufacturers to clarify the requirements within the scope permitted to 15-day changes. The resulting modifications were released with other modified text in the Notice of Public Availability of Modified Text on January 29, 2003. Although the manufacturers looked favorably upon the clarifications staff was able to make, they continued to express dissatisfaction with the requirement that liability include damages to the vehicle or equipment itself, and not simply the engine. Their primary concern is the potential for end-users to make spurious claims with the goal of obtaining new vehicles or equipment. The perceived financial risk has been significant enough to prevent some manufacturers from accepting the required warranty, and thus from attaining verification. Consequently, the range of verified emission control options available to end-users has been reduced.

The manufacturers' concerns have prompted staff to re-evaluate the merit of including vehicle/equipment damage in the warranty. Staff has therefore sought to (1) get a sense for the likelihood of such damage by reviewing field experience with diesel emission control strategies, and (2) determine the nature of the coverage afforded by other related warranties.

4.1.1 Experience with Failures/Damage in the Field

Staff has been involved with both demonstrations and commercial installations of diesel emission control systems on a variety of vehicles including school buses, solid waste collection vehicles, transit buses, long-haul trucks, and construction equipment. The majority of that experience has been with passive diesel particulate filters (DPFs) used in both verified and unverified applications. Although failures of verified systems in verified applications have been minimal, staff will not acknowledge the successes here. Instead, staff now emphasizes instances of failure and damage for verified as well as unverified systems:

- In January 2003, staff visited personnel of the City of Los Angeles in the Fleet Services division to get an update on their experiences with the over 300 solid waste collection vehicles that had been retrofitted with DPFs. They reported no engine or vehicle damage caused by the verified DPFs. Their own shop performed a couple of welds to repair cracks in two filter housings, but the overall experience has been positive. Los Angeles City Bureau of Sanitation staff has expressed satisfaction with current trends and the use of retrofits on their equipment. The sanitation trucks have logged 965,715 miles on DPF units with only a few minor problems. City of Los Angeles Bureau of Sanitation Services management said they will purchase more when funds are available.

  In an experimental demonstration project, four sanitation trucks were retrofitted with unverified systems that included an exhaust gas recirculation (EGR) system and a DPF. Two of the engines sustained damage and had to be replaced. One engine

sustained heat damage because the EGR system was incorrectly calibrated. The manufacturer of the unverified system paid for a replacement engine. The second engine was damaged because the wrong filter type was installed. The filter came loose and vibrations caused it to deteriorate. It shed small fragments of substrate which were directed back into the engine via the EGR component. That engine was also replaced by the system manufacturer. Those two instances are the worst retrofit-caused damage that staff has encountered to date. Had either of the two situations occurred with verified systems, the engine damage would have been completely covered by the warranty. The proposed amendment does not remove coverage of engine damage. It is noted in passing that when correctly calibrated and installed, that same EGR/DPF system has proven to be safe and effective in numerous transit bus applications.

- In the latter half of 2002, a private trucking fleet retrofitted over 100 of its long-haul trucks with verified DPFs. The company updated staff in early October 2003 on its experiences to date. The main problems encountered have been as follows: brackets did not fit properly and required reworking, backpressure sensor lines failed and required replacement, a number of DPF can components experienced failures due to a design flaw, and there has been difficulty in obtaining spare parts. The company is currently in the process of determining the exact extent of these issues. It reported no filter damage, and no engine or vehicle damage.

- Part of the South Coast Air Quality Management District's school bus demonstration program included the retrofit of buses powered by 1978 two-stroke engines (an unverified application) with DPFs. The worst failure that occurred was when one of the buses stalled because the filter plugged up and had to be towed. Nevertheless, there was subsequently no indication of engine or vehicle damage.

- One of the Los Angeles Metropolitan Transit Authority buses equipped with a DPF experienced a complete failure attributed to a bracket that came loose. The filter apparently rattled back and forth causing the substrate to gradually erode. By the time the problem was discovered, the substrate had been reduced to the size of a softball. Staff investigating the failure did not observe any engine or vehicle damage based on a visual examination of the bus and a review of data from subsequent emissions testing.

- ARB has been participating in an experimental demonstration program with the Construction Industry Air Quality Coalition (CIAQC) in which off-road construction equipment was retrofitted with DPFs (another unverified application). The program seeks to develop experience with retrofits in off-road applications, which are often extremely demanding physically. On-going reports from the field by the company Booz Allen Hamilton have described all failures and problems in detail. One of the most demanding pieces of equipment retrofitted with a DPF was a treaded bulldozer. Its extreme vibrations and lack of convenient location for installation of the DPF created problems for the DPF and the exhaust piping leading to it. In addition to the filter substrate itself sustaining damage, a tear developed in the exhaust piping just

downstream from the weld to the main exhaust manifold. Aside from that tear, no damage to the equipment was reported. Also, there has been no indication of any engine damage. Had the bulldozer installation been intended to support a verification, that DPF would not have been verified for that application.

The control strategies thus far encountered appear to have an extremely low probability for causing damage to vehicles and equipment. The Manufacturers of Emission Controls Association (MECA) strongly agrees with that observation. They tend to be more intimately involved with the engine and its operation than with other vehicle/equipment parts. Therefore, if some potential exists for damage to a significant component, it would most likely be the engine. Even so, the probability of a verified control strategy causing engine damage when used in an appropriate fashion is extremely low. Staff has not yet encountered any such cases. All instances of failure and damage mentioned above for verified systems would be covered by the proposed warranty.

4.1.2 Coverage in Related Warranties

The most similar program to ARB's in-use diesel emission control program is the U.S. EPA Urban Bus Retrofit/Rebuild Program, which was another mandatory emission control effort directed at in-use fleets. The program required a 100,000-mile defect warranty and 150,000-mile performance warranty (ARB requires 150,000 for both). However, manufacturers were not required to offer warranties that cover damages to the engine or vehicle caused by emission control systems. In addition, no durability demonstration was required by U.S. EPA. In the program's development phase, the warranty was a point of contention, as it is presently, but there were never any requirements written into the rule for secondary damages.

Besides investigating the U.S. EPA program's requirements, staff also reviewed warranty statements from various engine manufacturers and spoke directly with representatives from several of the larger companies. Engine warranties do not state that they cover damage to other vehicle components. They cover only the engines themselves.

Given staff's findings, it appears that explicit inclusion of damage to the engine and vehicle/equipment in a warranty is unprecedented.

4.1.3 Staff's Proposal

Although the potential for damage to vehicles/equipment does not appear to be significant, and related warranties do not afford the same level of consumer protection against secondary damages, owners may naturally be concerned should coverage of vehicle/equipment damage be removed from the warranty. First, it should be noted that the warranty required by ARB is the minimum required by law. Manufacturers may wish to offer enhanced warranties to make their products more attractive to potential customers. Some have already expressed that is their intent. More importantly, staff does not believe that removal of such coverage would place owners in an unreasonable situation. In the unlikely event that an owner's vehicle or equipment sustains damage

as a result of the malfunction of a verified diesel emission control strategy, the standard avenues of relief are available. Legal theories of negligence and product liability would provide the owner potential relief. The comprehensive coverage in the owner's vehicle insurance policy would be available to cover damage. Furthermore, business losses attributable to the damage may be covered under the vehicle owner's business interruption insurance.

Active participation of manufacturers is critical to achieving the health benefits called for by the DRRP. Because the potential for a verified control strategy to cause non-engine related damage is minimal, no related warranties afford the same level of coverage of secondary damages, and owners have all of the standard avenues to pursue for relief should such damage occur, staff proposes that the warranty required by ARB not include liability for damage caused to the vehicle or equipment with which a strategy is used.

4.2 NO_2 Limit

Another proposed amendment relates to the nitrogen dioxide (NO_2) emission limit. The Procedure currently requires that the emissions of NO_2 from an engine employing a diesel emission control strategy not exceed 20 percent of the baseline (engine-out) NOx emissions beginning on January 1, 2004. As of that date, no application for verification will be approved if the strategy does not meet the limit. In addition, previously verified strategies that do not meet the limit will no longer be considered verified for the purposes of new applications or new installations. Existing installations of such verified strategies, however, do not need to be removed and will continue to be recognized as verified by ARB. The diesel emission control strategies most directly affected by the NO_2 emission limit are those that oxidize nitric oxide (NO) in the exhaust to NO_2 which assists with the oxidation of PM (e.g., some passive diesel particulate filters). Such strategies have been shown to emit oxides of nitrogen (NOx) that have a significantly higher fraction of NO_2 than was originally present in the engine's exhaust.

As described in the Procedure's Initial Statement of Reasons (ISOR) released on March 29, 2002, ARB conducted atmospheric modeling for the year 2010 with various NO_2 fractions to investigate the effects of large-scale implementation of high-NO_2 strategies (ARB, 2002). The two basic assumptions that went into the modeling were that (1) 90 percent of all diesels were equipped with high-NO_2 diesel particulate filters, and (2) baseline NO_2 emissions were equivalent to 10 percent of the total NOx emissions. After reviewing the results of the modeling and presenting them before the International Diesel Retrofit Advisory Committee (February 6, 2002), staff determined that an NO_2 emission limit of 20 percent of the total baseline NOx emissions (by mass) would both minimize potential negative side effects (such as increases in ozone exposure) and potentially leave the door open for effective strategies that rely on the NO_2 oxidation mechanism. To give manufacturers time to redesign their control strategies to meet the limit, the Board approved an effective date of January 1, 2004.

Subsequent to the adoption of the Procedure, staff received several comments from manufacturers which, for the most part, did not support the NO_2 limit. Each comment is discussed in turn, below.

4.2.1 Variability of Engine-out and DPF-out NO_2 Emissions

One issue raised by manufacturers is that the variability of engine-out NO_2 will reduce the ability of verifications to cover a range of engine families, thus dramatically increasing the cost of verification.

That comment has merit for the following reasons. Systems are verified on the basis of groups of engines and applications that are defined by parameters relevant to the system being verified (emission control groups). If a passive DPF is shown to work on a truck with an engine certified to a particular PM emission standard, it can be verified for similar engines that meet the same standard. If testing shows that a DPF meets the NO_2 limit on a particular engine, staff has no certification standard or database of NO_2 emission data for reference to assist in determining other engines for which the DPF can be verified.

Without taking NO_2 into account, the emission control group for which passive DPFs are currently verified is large and well-defined (nearly all 1994-2002 on-road engines). The same cannot be said when NO_2 enters the picture. All of the vehicles in the EC-Diesel Technology Validation Program were in that same emission control group (LeTavec, 2000). Figures 1 and 2 show NO_2 fractions[1] for vehicles in the program equipped with one of the verified DPFs. The data is sorted by test cycle in Figure 1 and by engine series in Figure 2. In each case, a wide spectrum of NO_2 fractions is observed, often ranging 30 to 40 percentage points for each subgroup. Such a spread is large given that the limit is set at 20 percent. The data suggests that both test cycle and engine-type can have a significant impact on the NO_2 fraction. That observation is especially significant given that (1) all of the engines tested were from the same emission control group, and (2) baseline testing of other vehicles in the same fleets with the same engines showed a low engine-out NO_2 fraction with little absolute variation (5.0±0.8 percent[2]). The implication is that the 1994-2002 on-road group may need to be further subdivided in some fashion, but there is no clear indication as to what parameters should be used to do so. Such a subdivision could make verification much more burdensome for the applicant as it attempts to determine with which groups of engines its product will meet the NO_2 limit.

4.2.2 Engines With NO_2 in Excess of 20% of NOx

Another comment received by staff stated that there are engines in California with engine-out NO_2 levels in excess of 20 percent. Although most of the limited data collected by staff indicates that 5 percent NO_2 is more typical, there are data that support the comment. One manufacturer has submitted data indicating that a 1999

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[1] NO_2 fractions were calculated by staff using NO and NOx emissions data from the ECD Technology Validation Program's Master Spreadsheet (Vertin, 2002).

[2] Based on data from (Vertin, 2002), as above. This result is for a 95 percent confidence interval and excludes three instances where staff found negative NO_2 fractions.

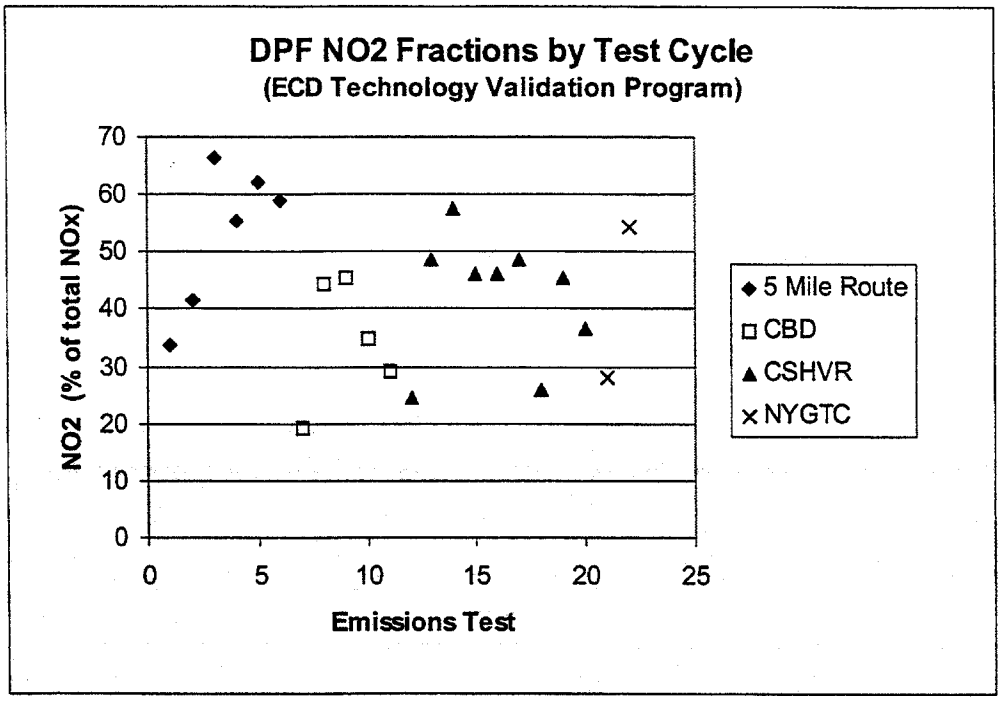

Figure 1. Note that CBD = Central Business District, CSHVR = City Suburban Heavy Vehicle Route, and NYGTC = New York Garbage Truck Cycle.

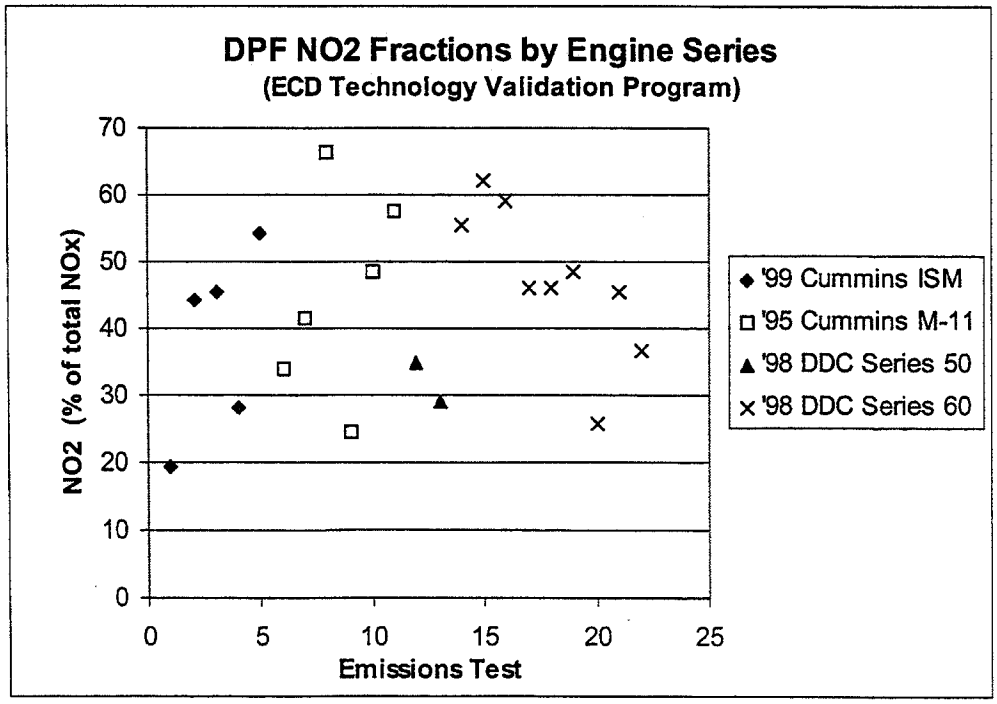

Figure 2.

Navistar 7.3-liter engine has a baseline NO_2 fraction of about 21 percent as measured over the heavy-duty transient Federal Test Procedure (FTP). Another manufacturer submitted data for a 1990 Navistar DT-466 using the same test procedure which indicate an 18 percent NO_2 fraction. Such engines would allow little to no increase in NO_2 emissions. Following the letter of the Procedure would prohibit retrofit of some high-NO_2 engines unless a control strategy actually reduced the engine-out NO_2 fraction.

4.2.3 Lead Time for Product Development

Several companies opposed the January 1, 2004, effective date on the grounds that it will not provide adequate time for development of compliant products. Although not yet verified, there are a number of commercially-available passive DPFs that comply with the NO_2 limit, but they use less active catalysts. As a result, they have significantly higher exhaust temperature requirements and therefore are compatible with a more restricted range of applications. Staff is aware of some progress being made with lowering NO_2 emissions from passive filters with a greater range of applicability, but to date, there are no verified Level 3 diesel emission control strategies that meet the NO_2 limit. Therefore, unless new compliant systems are verified soon, California stands to lose valuable early field experience and PM reductions that can be gained prior to the implementation of fleet rules.

4.2.4 Atmospheric Modeling Uncertainties

At the present time, diesel engine NO_2 emissions have not been adequately characterized. Historically, NO_2 has never been measured during diesel engine emissions testing. ARB's atmospheric modeling assumed an average engine-out NO_2 fraction of 10 percent, which is the conventional fraction used when modeling NOx emissions from combustion sources in general. The accuracy of that assumption for diesel engines specifically is not well established. As already discussed, the limited data staff has collected indicate that the NO_2 fraction may vary substantially from one engine to another. The extent to which that variability is due to different test cycles or test conditions is not known at this time.

In addition to the uncertainty surrounding baseline NO_2 emissions, there are also questions concerning the modeling assumption that 90 percent of all diesels will be equipped with high-NO_2 diesel particulate filters by 2010. To date, passive DPFs are only verified for 1994-2002 on-road engines that meet certain exhaust temperature requirements. Exhaust temperature data from various solid waste collection vehicles indicates that only about one third of such vehicles with 1994-2002 engines would meet the temperature requirements of the currently-verified passive DPFs (ARB, 2003). Because passive DPFs are limited in their application to engines that are not too dirty or too cold, 90 percent penetration into the entire diesel fleet appears to be unrealistic.

In order to determine the significance of a more realistic fleet penetration scenario, ARB has initiated another atmospheric modeling effort using a new scenario. The new scenario acknowledges the limited application of passive DPFs and introduces a mix of retrofit technologies as well as the option of repowering with cleaner engines. The goal

of the new modeling effort is to determine what an appropriate NO_2 limit might be in light of the more realistic scenario. At the present time, staff has not yet completed this study.

4.2.5 Staff's Proposal

In order to more meaningfully and realistically evaluate diesel emission control strategies that increase NO_2 emissions, the questions raised above need to be resolved. Staff therefore proposes that the effective date for the NO_2 limit be delayed. The duration of the delay must be long enough to give staff the time it needs to gather additional data and develop a better understanding of the NO_2 issue, and yet not so long as to have significant penetration of high-NO_2 strategies into the fleet.

Based on a draft implementation schedule for fleet rules, staff estimates that only 2 percent of the diesel fleet (sum of on- and off-road) will be required to use Best Available Control Technology (BACT) by the end of 2006. By the end of 2007, staff estimates that percentage to increase to about 8 percent (22 percent of the on-road fleet) if, as staff expects, off-road implementation has not yet begun. Compared to the 90 percent penetration of high-NO_2 strategies used in the modeling, the 2 and 8 percent estimates do not seem significant, especially since BACT is certainly not limited to technologies with high NO_2 emissions[3]. Nevertheless, staff opts for a conservative stance and recommends that a proposed delay not extend beyond the end of 2006 (a three year delay). Staff's conservative position is reasonable because the early, voluntary retrofit activity taking place in California may result in more than 2 percent implementation by the end of 2006. The new modeling effort now underway, in fact, will examine the effects of the delay using a scenario with more widespread implementation.

Besides additional atmospheric modeling, the delay will afford staff more time to gather NO_2 emissions data that will be necessary to address the issues raised above. Staff will obtain data from ARB's Heavy-Duty Emissions Test Laboratory, applications submitted for verification, and from demonstration projects and studies around the world. The additional atmospheric modeling and emissions data will be necessary to determine if a different NO_2 limit is appropriate, and more generally if a simple limit is the appropriate way to address NO_2 concerns.

The proposed delay will be welcomed by many manufacturers of emission control systems. In response to a request for comments issued in September 2003 which asked for input on the NO_2 issue in general, the Manufacturers of Emission Controls Association (MECA) indicated that it supports delaying the effective date and looks forward to working with staff to resolve the complex issues posed by controlling NO_2 emissions. The delay will also give manufacturers more time for product development aimed at reducing NO_2 emissions. As mentioned earlier, staff is aware of some

[3] Active DPFs and repowering with 2007 engines, for example, are NO_2–compliant alternatives that achieve Level 3 PM reductions. Although 2007 engines may have high NO_2 fractions, they will likely emit less NO_2 than older engines because of their much lower overall NOx emissions. Level 3 applies to strategies that reduce PM by 85 percent or more, or to less than 0.01 grams per brake-horsepower hour.

progress being made with lowering NO_2 emissions from passive filters. Continued development requires time and money. The delay will provide additional time as well as additional opportunities to generate the revenue needed for development from the sale of current designs.

In 2002, ARB considered and adopted a reasonable yet protective NO_2 standard. New information and unanswered questions indicate that there is potential for that to change. In order to balance concerns over the health effects of higher NO_2 emissions and unmitigated PM emissions, staff proposes that the effective date of the NO_2 emission limit be delayed by three years to January 1, 2007.

4.3 Proposed Verification Testing Protocol

The first step in the verification process that an applicant takes is preparation of the Proposed Verification Testing Protocol, described in Section 2702(b) of the Procedure. The purpose of requiring the proposed protocol is to give staff the opportunity to understand the nature of the product under consideration, to determine the need for additional analyses, and to ensure that the planned testing is in accordance with the requirements for verification.

There are several reasons why it is critical for staff to develop a good understanding of how an emission control system works. The Procedure is intended to be sufficiently flexible and comprehensive to evaluate all kinds of diesel emission control strategies, whether they use aftertreatment hardware, an alternative diesel fuel, or some other method of reducing emissions. In order to determine which parts of the Procedure apply to a given product, staff must understand the product. That is especially true when applicants request alternatives to required test methods. A key determination that staff must make is whether additional analyses for other harmful pollutants are necessary. That determination, and the public health protection which motivates it, utterly depend on staff developing a good comprehension of the product. Another task that staff must perform which hinges on a good understanding is the determination of the limits of a product's applicability. If staff knows how a product works, it can reasonably estimate the breadth of engines and applications for which verification is merited based on a given set of emissions test data. Without understanding the principles of operation, staff may need to see data for each and every engine for which the applicant seeks verification. That situation would make verification extremely cost prohibitive. It is therefore in the best interests of the applicants as well as the public that staff gains the understanding it needs.

For the reasons noted above, one of the subsections of the proposed protocol requires that the applicant describe its system's principles of operation. The existing language is sufficient for handling technologies, such as diesel particulate filters, that function via processes that are generally understood. If, however, an applicant describes principles of operation that do not appear to be generally understood or accepted by the scientific world, the existing language does not provide clear guidance on how staff is to proceed. Section 2700 indicates that the Procedure applies to in-use strategies that are able to control emissions through the use of sound principles of science and engineering, but

does not provide any process for handling cases that do not at first appear to meet that criterion.

To fill that need, staff proposes adding language to subsection 2702(b). The proposed language states that it is the responsibility of the applicant to demonstrate that its product relies on sound principles of science and engineering to achieve emission reductions. That statement will help to ensure that applicants realize it is not staff's responsibility to demonstrate the soundness of their products, but rather their own. The applicant must perform any research necessary to substantiate a novel or unique approach to reducing emissions.

If, after reviewing the proposed protocol, the Executive Officer determines that the applicant has not made a satisfactory demonstration of the soundness of its product, staff proposes that the applicant be given a second opportunity (60 days) to submit additional material and clarifications that explain the principles of operation. Based on past experience, applicants may need feedback from staff in order to understand what a satisfactory demonstration entails. Thus, a second opportunity for explanation is proposed. Staff includes a time limit of 60 days to prevent an endless exchange of informal questions and answers via telephone and email with applicants that are not actually prepared for verification.

After review of the second submittal, the Executive Officer may determine to either continue the verification process or to suspend the application. Because of limited staff resources, staff proposes that applicants be limited to two formal attempts to explain their products. If an application has been suspended, it may only be reactivated at the discretion of the Executive Officer. In that manner, applicants with suspended applications may still have an opportunity to have their products verified, but ARB is not obligated to expend additional resources reviewing those applications.

Staff also proposes that if at any point in the verification process the Executive Officer has reason to doubt the scientific or engineering soundness of a product, the Executive Officer can require the applicant to provide further substantiation or risk suspension of the application. It is possible that a product may at first appear sound based on review of the proposed verification testing protocol, but that subsequent information could suggest otherwise. If, for instance, staff conducts its own emission testing using an applicant's product and finds inconsistent results, staff may require that the applicant explain the situation and potentially modify the product to correct a problem.

In addition to the above, staff proposes adding another section to the proposed protocol in which the applicant simply states that the applicant agrees to provide a warranty pursuant to the requirements in the Procedure. Based on past experience, staff finds that it is important for the applicant to be aware of the warranty requirements and the potential costs thereof early on in the verification process.

4.4 Harmonization of Durability Requirements

The final major proposed amendment relates to durability requirements and is born of an effort to harmonize with U.S. EPA's verification protocol. The Procedure currently requires that emission reduction testing for a diesel emission control strategy be performed before and after the service accumulation period. Although it does not explicitly state that the testing must be performed on the same unit before and after, that was the intention. The verification protocol used to support U.S. EPA's Voluntary Diesel Retrofit Program, however, calls for testing of both a pre-conditioned (or "de-greened") unit and an aged unit at the same point in time, with testing of a single unit at two different times (before and after service accumulation) left as an option.

Although ARB and U.S. EPA's diesel programs are different, staff nevertheless recognizes the value of harmonizing the verification requirements to the greatest extent possible. Staff therefore proposes amending the Procedure to explicitly allow applicants to request that the Executive Officer consider having the durability testing requirement fulfilled via testing two identical units at the same time, one pre-conditioned and one aged. This testing option is limited to those control strategies that have no significant effect on the engine over time. If there is reason to suspect that a strategy may have engine effects, testing before and after the service accumulation on the same engine with a single unit would likely be required. Because of the importance of establishing a system's performance when pre-conditioned, staff will pay close attention to an applicant's request to use the two-unit option. In particular, staff will examine the quality of the evidence that the applicant provides to support that the two units are identical. If the applicant is in the U.S. EPA verification process and has reached an agreement with U.S. EPA to use two units, staff will also take that into consideration.

Both the U.S. EPA and ARB are engaged in an on-going effort to harmonize their respective verification requirements. The proposed modification is one more step in that direction.

4.5 Additional Proposed Amendments

Definitions: Staff added the definitions for the terms "Emergency Use " and "ALSF-1 and ALSF-2" and modified the definitions of the terms "Emergency Standby Engine," "Portable Diesel Engine," and "Stationary Diesel Engine" to make them consistent with the corresponding definitions for those terms in the proposed Airborne Toxic Control Measure to Reduce Diesel Particulate Matter Emissions from Stationary Diesel-Fueled Compression Ignition Engines (stationary ATCM). While the proposed stationary ATCM does not require the use of verified systems, ARB staff anticipates that in some cases owners of stationary diesel engines will use verified technology to comply with the emission limits defined in the proposed ATCM. To avoid potential uncertainty regarding the applicability of the verification emission test results in meeting the proposed stationary ATCM's emission limits, ARB staff believes it is important that the definitions in the Procedure be consistent with the definitions in the proposed ATCM.

Off-road and Stationary Engine Test Requirements: To verify a diesel emission control strategy for use with off-road and stationary engines, applicants must follow the test

procedure defined in ARB off-road diesel engine regulations. The original language in subsections 2703(e)(2) and (3) incorrectly implied that the off-road regulations had a number of different test cycles from which applicants could select the most appropriate one. Staff clarified that the regulations require the use of a specific test cycle, but that applicants may nevertheless request the Executive Officer to consider alternatives.

Alternative Test Cycles and Methods: Section 2703(f) lists examples of items that the Executive Officer may consider when evaluating an applicant's request to use an alternative test cycle or method. To that list, staff added test procedures specified in airborne toxic control measures (ATCMs) adopted by the ARB. With that modification, applicants are alerted to the fact that ATCMs may specify test procedures that differ from those in the Procedure, but that those test procedures may be used towards verification with approval from the Executive Officer.

Procedure for Measuring NO_2: Section 2706(a)(3) indicates that part of the NO_2 calculation involves subtracting NO from NOx on a second-by-second basis. While that method is useful for observing how NO_2 emissions vary over time and in different modes of operation within a test cycle, it is not the preferred method for determining the average NO_2 over the cycle. For cycle-average NO_2, it is more accurate to simply subtract the cycle-average value of NO from that for NOx, as is done by all of the laboratories staff has dealt with. Staff therefore proposes that the Procedure be modified accordingly.

Limits on Other Pollutants: Section 2706(b) specifies that verified diesel emission control strategies must not increase the emissions of CO greater than the current CO emission standards for new diesel engines. Staff proposes amending this requirement for stationary engine applications to make it consistent with the requirements of the proposed ATCM for stationary diesel-fueled compression-ignition (CI) engines. The amended language requires diesel emission control strategies for stationary applications to not increase the emissions of CO by more than 10 percent above baseline levels. Staff believes this is appropriate for stationary engine applications because many of the existing stationary engines currently operating in California are not certified to off-road CI engine standards. As such, staff believes requiring verified diesel emission control technologies to reduce CO emission rates to that of a new off-road certified engine may be overly burdensome and beyond the primary goal of the verification process, which is to verify reductions in diesel PM and NOx.

5 INTERACTION WITH OTHER ARB DIESEL PROGRAMS

The proposed amendments do not affect the basic interaction of the Procedure with other ARB diesel programs. Two items are worth noting, however. First, some of the proposed amendments help to align the Procedure with ATCMs. Staff proposes including consistent definitions and listing ATCM test procedures for consideration as alternative test methods to help the Procedure achieve smoother integration with ATCMs. Second, the proposed delay of the NO_2 limit's effective date extends the

amount of time that various verified diesel emission controls will be eligible to participate with various retrofit programs. Thus, PM reductions may continue to be realized even before most of the fleet rules are implemented.

6 ISSUES OF CONTROVERSY

6.1 Warranty

Staff expects most of the controversy to center around the proposed amendment to the warranty requirements. At the May 16, 2002 public hearing, the California Trucking Association (CTA) commented that the warranty periods were too short and therefore did not protect the consumer. CTA raised warranty issues again at the September 25, 2003 public hearing to consider the fleet rule for solid waste collection vehicles. In response to the September 2003 request for comments, CTA voiced its opposition to the proposed warranty change. Similarly, the California Independent Oil Marketers Association indicated that it insists there be full warranty protection for engines and vehicles. Obviously, any change to the warranty which appears to reduce consumer protection is of great concern to the eventual end-users of the emissions control strategies.

As discussed earlier in Section 4.1, staff's experience with systems in the field indicates that the potential for a verified control strategy to cause non-engine related damage is minimal. Despite this, the potential for even a single "deep-pockets" pay-out has the manufacturers of various proven emissions control systems contemplating withdrawing from active involvement in the Diesel Risk Reduction Plan. Staff believes modification of the warranty is necessary to ensure that their involvement will continue.

It should be pointed out that in the unlikely event that an owner's vehicle or equipment sustains damage as a result of the malfunction of a verified diesel emission control strategy, the standard avenues of relief are available. These include the legal theories of negligence and products liability as well as coverage by vehicular and business interruption insurance policies. Staff does not believe, therefore, that the proposed amendment would place owners in an unreasonable situation.

When the warranty ARB requires is compared against other relevant warranties, even with the proposed change, one finds that the coverage affords greater consumer protection. The warranty required in the U.S. EPA Urban Bus Retrofit/Rebuild Program consisted of a 100,000-mile defect warranty and 150,000-mile performance warranty (ARB requires 150,000 for both). However, manufacturers were not required to offer warranties that cover damages to the engine or vehicle caused by emission control systems. Engine warranties do not state that they cover damage to other vehicle components either. They cover only the engines themselves. For these reasons, staff again states that the end-user would not be placed in an unreasonable situation as a result of removing coverage of vehicle/equipment damage from the warranty.

Motivated by discussions at ARB's public hearing in September, staff has surveyed major diesel emission control system manufacturers to inquire about the availability of extended warranties. The survey revealed that none are currently offering extended warranties on their emission control systems, although one indicated it definitely will do so in the near future. The main reason for the unavailability of extended warranties is the uncertainty surrounding the current warranty required by the Procedure. The uncertainty stems from the fact that the manufacturers have recently been verified or are in the verification process, and so the ramifications of the required warranty are not yet known. Most companies want to reevaluate the situation once the verification program has matured further so that they can determine whether the required warranty is sufficient or if extended warranties should be made available. One company has indicated that it may offer extended warranties for large fleets in the future. The company that indicated it definitely will offer extended warranties said it plans to offer a variety of warranties to solid waste collection vehicle fleets in the near-term, as well as full maintenance leases and preventative maintenance contracts.

6.2 NO_2 Limit

Although many manufacturers of emission control systems support delaying the effective date of the NO_2 limit, other parties, including some manufacturers, have submitted comments indicating their support for not changing the date. While it is encouraging that some manufacturers have confidence in their ability to provide NO_2–compliant products, those manufacturers' products have not yet been verified. None of the currently-verified Level 3 emission control systems can meet the NO_2 limit.

The imminent effective date of the NO_2 limit, unless changed, stands to eliminate a significant amount of near-term PM emission reductions and invaluable early field experience with retrofits. In addition, as described in Section 4.2, there are significant questions that staff must address concerning how to meaningfully and realistically evaluate emission control strategies that increase NO_2 emissions. Staff therefore holds to its proposal to delay the effective date by three years to allow for more time to resolve those issues.

7 REGULATORY ALTERNATIVES

While developing the proposal, staff considered a number of regulatory alternatives described below.

7.1 No Change to Warranty

If staff elected to retain the coverage of damage to the vehicle or equipment in the warranty, it is likely that many manufacturers of diesel emission control systems would reduce or cease their participation in California's retrofit market. Large and small manufacturers alike have expressed that inclusion of such damages makes the liability too large to risk participation. If manufacturers turn their attention only towards other states and to the original equipment market, California stands to lose enormous benefits associated with reduced diesel PM emissions from the in-use fleet. Therefore, while not

changing the warranty would likely be supported by fleet owners, it is not in the best interest of Californians in general.

7.2 No Change to Effective Date of NO_2 Limit

Retaining the January 1, 2004, effective date for the NO_2 limit is the most conservative way to address concerns over elevated NO_2 emissions from certain emission control systems. Unfortunately, doing so would significantly reduce near-term diesel PM emission reductions that are being achieved by numerous publicly-funded retrofit programs. It would also greatly diminish the invaluable field experience that these technologies are gaining. That experience will play a vital role in the success of future fleet rules. As discussed in Section 4.2, there are significant questions concerning the appropriateness of the current form of the limit and the assumptions that led to its determination. Finally, the proposed delay does not afford high-NO_2 systems enough time to achieve large-scale penetration, and thus prevents negative regional health effects.

8 ECONOMIC IMPACTS

The proposed amendments to the Procedure modify a protocol for evaluation of in-use diesel emission control technologies. Participation in the Diesel Emission Control Strategy Verification program is purely voluntary and a business would presumably use the Procedure only if it believed doing so was financially advantageous. The proposed amendments in no way change the voluntary nature of the Procedure. They do, however, further harmonize the Procedure with that of the U.S. EPA and potentially reduce the financial burden on applicants.

8.1 Legal Requirement

Section 11346.3 of the Government Code requires State agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulation. The assessment shall include a consideration of the impact of the proposed regulation on California jobs, business expansion, elimination or creation, and the ability of California business to compete with business in other states.

State agencies are also required to estimate the cost or savings to any State or local agency and school district in accordance with instructions adopted by the Department of Finance. The estimate shall include any non-discretionary cost or saving to the local agencies and the cost or saving in federal funding to the State.

8.2 Affected Businesses

Participation in California's diesel emission control program is not mandatory. However, any business or individual that chooses to participate in the program will have to satisfy the requirements of the Procedure. Businesses that choose to participate and thus follow the Procedure include manufacturers and marketers of diesel emission control

technologies. Also, some businesses may be indirectly affected, such as suppliers of raw materials or equipment to participants.

8.3 Potential Impact on California Businesses

The requirements for verification under the Procedure apply to any business that wishes to sell its products in California, regardless of its location. The proposed amendments do not alter that universality. Should any manufacturer or marketer elect to participate in the verification program, it would need to provide detailed information and data on the product in accordance with the Procedure. The testing required by the Procedure may require significant expenditures of capital on the part of a company. The proposed amendments to the Procedure will either cause no change in the cost of testing or potentially reduce the cost if an applicant is approved to use the proposed two-unit durability testing option.

Should a business choose not to participate in the verification program, there are other avenues by which its products may be sold in California. A business having a Vehicle Code 27156 exemption can legally sell the product in California, but can claim no emissions reductions. The product would not be a verified diesel emission control strategy, and would not satisfy the requirements of the fleet rules.

8.4 Potential Impact on Employment

The proposed amendments to the Procedure are not expected to cause a noticeable change in California employment and payroll. Participation in the program is voluntary and presumably only businesses able to afford the program will participate.

8.5 Potential Impact of Business Creation, Elimination or Expansion

The proposed amendments to the Procedure will not impact the status of California business in a noticeably different way from the original version of the Procedure, aside from extending the period of time that products with NO_2 fractions above the limit can be sold.

8.6 Potential Impact on Business Competitiveness

The proposed amendments to the Procedure would have no significant impact on the ability of California's businesses to compete with businesses in other states. Staff's proposals do not change the voluntary nature of the Procedure or its applicability to all businesses that manufacture or market diesel emission control technologies regardless of their location.

8.7 Potential Impact to California State or Local Agencies

The proposed amendments to the Procedure will not create costs or savings, as defined in Government Code section 11346.5 (a)(6), to any State agency or in federal funding to the State, costs or mandate to any local agency or school district whether or not reimbursable by the State pursuant to Part 7 (commencing with section 17500, Division 4, Title 2 of the Government Code), or other non-discretionary savings to local agencies.

8.8 Estimated Costs

As noted previously, the proposed amendments do not change the voluntary nature of the Procedure. Those manufacturers that wish to market diesel emission control strategy devices in California may wish to obtain verification using the Procedure. The Procedure includes emissions and durability testing requirements. The proposed amendments to the Procedure will either cause no change in the cost of testing or potentially reduce the cost if an applicant is approved to use the proposed two-unit durability testing option.

9 ENVIRONMENTAL IMPACTS

No direct environmental impacts can be associated with the staff proposal, as the proposal would simply modify an existing methodology and protocol for evaluating diesel emission control strategies. While the proposed amendments would extend the amount of time that a strategy which does not meet the NO_2 limit would be verified, that period of time falls far short of when significant implementation of strategies is planned. Thus, as discussed in Section 4.2, no significant environmental impacts are expected. Emissions benefits due to use of the strategies evaluated through this Procedure will be estimated as part of the development of regulations or other programs to implement the strategies.

10 COST-EFFECTIVENESS

Because no direct emissions benefits are associated with the staff proposal, no traditional cost effectiveness can be calculated. When staff proposes rules to implement in-use controls for the various categories of diesel engines, it will provide more detailed estimates, taking into account the specific issues associated with each category.

11 CONCLUSION

The proposed amendments to the Procedure, as described herein, would help ARB in its efforts to implement the Diesel Risk Reduction Plan and better protect public health. ARB staff recommends that the Board adopt the proposed amendments to sections 2700 to 2710, Title 13, of the California Code of Regulations, as set forth in the proposed Regulation Order in Appendix A.

12 REFERENCES

Air Resources Board. Staff Report: Technical Support Document – Proposed Control Measure for Diesel Particulate Matter From On-Road Heavy-Duty Diesel-Fueled Residential and Commercial Solid Waste Collection Vehicle Diesel Engines. June 6, 2003.

Air Resources Board. Staff Report: Initial Statement of Reasons – Proposed Regulation for the Verification Procedure for In-Use Strategies to Control Emissions from Diesel Engines. March 29, 2002.

Air Resources Board. Diesel Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles. October 2000.

LeTavec, C., Uihlein, J., Segal, J., and Vertin, K. "EC-Diesel Technology Validation Program Interim Report," SAE 2000-01-1854, Society of Automotive Engineers, 2000.

Vertin, K. EC-Diesel Technology Validation Program Master Spreadsheet, Round 2. National Renewable Energy Laboratory. Updated August 21, 2002. Requests for the spreadsheet should be sent to: teresa_alleman@nrel.gov

Appendix A. Proposed Regulation Order

NOTE: This document is printed in a style to indicate changes from the adopted regulation. All original language is indicated by plain type. The proposed amendments are shown in underline to indicate additions to the original language and ~~strikeout~~ to indicate deletions. The symbol "*****" means that the remainder of the text of the regulation for a specific section is not shown, but has been incorporated by reference, unchanged.

NOTE: Adopt Title 13, California Code of Regulations, sections 2701, 2702, 2703, 2704, 2705, 2706 and 2707, to read as follows:

Chapter 14. Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines

§ 2701. Definitions

(a) The definitions in Section 1900(b), Chapter 1, Title 13 of the California Code of Regulations are incorporated by reference herein. The following definitions shall govern the provisions of this chapter:

(1) "15 ppmw or less sulfur fuel" means diesel fuel with a sulfur content equal to or less than 15 parts per million by weight (ppmw).

(2) "Alternative Diesel Fuel" means any fuel used in diesel engines that is not commonly or commercially known, sold or represented as diesel fuel No. 1-D or No. 2-D, pursuant to the specifications in ASTM Standard Specification for Diesel Fuel Oils D975-81, and does not require engine or fuel system modifications for the engine to operate, although minor modifications (e.g. recalibration of the engine fuel control) may enhance performance. Examples of alternative diesel fuels include, but are not limited to, biodiesel, Fischer Tropsch fuels, and emulsions of water in diesel fuel. Natural gas is not an alternative diesel fuel. An emission control strategy using a fuel additive will be treated as an alternative diesel fuel based strategy unless:

(A) The additive is supplied to the vehicle or engine fuel by an on-board dosing mechanism, or

(B) The additive is directly mixed into the base fuel inside the fuel tank of the vehicle or engine, or

(C) The additive and base fuel are not mixed until vehicle or engine fueling commences, and no more additive plus base fuel combination is mixed than required for a single fueling of a single engine or vehicle.

(3) "Approach Light System with Sequenced Flasher Lights in Category 1 and Category 2 Configurations" (ALSF-1 and ALSF-2) mean high intensity approach lighting systems with sequenced flashers used at airports to illuminate specified runways during category II or III weather conditions, where category II means a decision height of 100 feet and runway visual

range of 1,200 feet, and category III means no decision height or decision height below 100 feet and runway visual range of 700 feet.

(4) ~~(3)~~ "Applicant" means the entity that has applied for or has been granted verification under this Procedure.

(5) ~~(4)~~ "Auxiliary Emission Control Device" (AECD) means any device or element of design that senses temperature, vehicle speed, engine revolutions per minute (RPM), transmission gear, manifold vacuum, or any other parameter for the purpose of activating, modulating, delaying, or deactivating the operation of the emission control system.

(6) ~~(5)~~ "Average" means the arithmetic mean.

(7) ~~(6)~~ "Backpressure Monitor" means a device that includes a sensor for measuring the engine backpressure upstream of a hardware-based diesel emission control system or component thereof installed in the exhaust system and an indicator to notify the operator when the backpressure exceeds specified high and in some cases low backpressure limits, as defined by the engine manufacturer or the applicant for verification of a diesel emission control strategy.

(8) ~~(7)~~ "Baseline" means the test of a vehicle or engine without the diesel emission control strategy implemented.

(9) ~~(8)~~ "Cold Start" means the start of an engine only after the engine oil and water temperatures are stabilized between 68 and 86 degrees F for a minimum of 15 minutes.

(10) ~~(9)~~ "Diesel emission control strategy" or "Diesel emission control system" means any device, system, or strategy employed with an in-use diesel vehicle or piece of equipment that is intended to reduce emissions. Examples of diesel emission control strategies include, but are not limited to, particulate filters, diesel oxidation catalysts, selective catalytic reduction systems, fuel additives used in combination with particulate filters, alternative diesel fuels, and combinations of the above.

(11) ~~(10)~~ "Diesel Emission Control Strategy Family Name." See Section 2706(g)(2).

(12) ~~(11)~~ "Diesel Engine" means an internal combustion engine with operating characteristics significantly similar to the theoretical diesel combustion cycle. The primary means of controlling power output in a diesel cycle engine is by limiting the amount of fuel that is injected into the combustion chambers of the engine. A diesel cycle engine may be petroleum-fueled (i.e., diesel-fueled) or alternate-fueled.

(13) ~~(12)~~ "Durability" means the ability of the applicant's diesel emission control strategy to maintain a level of emissions below the baseline and maintain its physical integrity over some period of time or distance determined by the Executive Officer pursuant to these regulations. The minimum durability testing periods contained herein are not necessarily meant to represent the entire useful life of the diesel emission control strategy in actual service.

~~(13) "Emergency/Standby Engine" means an internal combustion engine used only as follows: (1) when normal power line or natural gas service fails; or~~

~~(2) for the emergency pumping of water for either fire protection or flood relief. An engine operated to supplement a primary power source when the load capacity or rating of the primary power source has been either reached or exceeded is not an emergency/standby engine.~~

(14) "Emergency Standby Engine" means a diesel engine operated solely for emergency use, except as otherwise provided in airborne toxic control measures adopted by the ARB.

(15) "Emergency Use" means using a diesel engine to provide electrical power or mechanical work during any of the following events and subject to the following conditions:

(A) The failure or loss of all or part of normal electrical power service or normal natural gas supply to the facility.

(B) The failure of a facility's internal power distribution system.

(C) The pumping of flood water or sewage to prevent or mitigate a flood or sewage overflow.

(D) The pumping of water for fire suppression or protection.

(E) The powering of ALSF-1 and ALSF-2 airport runway lights under category II or III weather conditions.

(F) Other conditions as specified in airborne toxic control measures adopted by the ARB.

(16) ~~(14)~~ "Emission control group" means a set of diesel engines and applications determined by parameters that affect the performance of a particular diesel emission control strategy. The exact parameters depend on the nature of the diesel emission control strategy and may include, but are not limited to, certification levels of engine emissions, combustion cycle, displacement, aspiration, horsepower rating, duty cycle, exhaust temperature profile, and fuel composition. Verification of a diesel emission control strategy and the extension of existing verifications are done on the basis of emission control groups.

(17) ~~(15)~~ "Executive Officer" means the Executive Officer of the Air Resources Board or the Executive Officer's designee.

(18) ~~(16)~~ "Executive Order" means the document signed by the Executive Officer that specifies the verification level of a diesel emission control strategy for an emission control group and includes any enforceable conditions and requirements necessary to support the designated verification.

(19) ~~(17)~~ "Fuel Additive" means any substance designed to be added to fuel or fuel systems or other engine-related systems such that it is present in-cylinder during combustion and has any of the following effects: decreased emissions, improved fuel economy, increased performance of the entire vehicle or one of its component parts, or any combination thereof; or assists diesel emission control strategies in decreasing emissions, or improving fuel economy or increasing performance of a vehicle or component part, or any combination thereof. Fuel additives used in conjunction with diesel fuel may be treated as an alternative diesel fuel. See Section 2701 (a)(2).

(20)~~(18)~~ "Hot Start" means the start of an engine within four hours after the engine is last turned off. The first hot start test run should be initiated 20 minutes after the cold start for Federal Test Procedure testing following Section 86.1327-90 of the Code of Federal Regulations, Title 40, Part 86.

~~(19) "Portable Diesel Fueled Diesel Engine" means a diesel fueled diesel engine which is designed and capable of being carried or moved from one location to another and does not remain at a single location for more than 12 consecutive months. Engines used to propel mobile equipment or a motor vehicle of any kind are not portable engines. Examples of portable diesel fueled engine applications include, but are not limited to cranes, pumps, welders, woodchippers, tactical support equipment (military), power generation sets, pile driving hammers, service or work over rigs, dredges or boats or barges, and compressors. The definitions in Title 13 California Code of Regulations Section 2452(g) and Section 2452(x) are incorporated by reference herein.~~

(21) "Portable Engine" means an engine designed and capable of being carried or moved from one location to another, except as defined in Section 2701(a)(24). Engines used to propel mobile equipment or a motor vehicle of any kind are not portable. Indicators of portability include, but are not limited to, wheels, skids, carrying handles, dolly, trailer, or platform. A portable engine cannot remain at the same facility location for more than 12 consecutive rolling months or 365 rolling days, whichever occurs first, not including time spent in a storage facility. If it does remain at the facility for more than 12 months, it is considered to be a stationary engine. The definitions in Title 13 California Code of Regulations Section 2452(g) and Section 2452(x) are incorporated by reference herein.

(22)~~(20)~~"Regeneration", in the context of diesel particulate filters, means the periodic or continuous combustion of collected particulate matter that is trapped in a particulate filter through an active or passive mechanism. Active regeneration requires a source of heat other than the exhaust itself to regenerate the particulate filter. Examples of active regeneration strategies include, but are not limited to, the use of fuel burners and electrical heaters. Passive regeneration does not require a source of heat for regeneration other than the exhaust stream itself. Examples of passive regeneration strategies include, but are not limited to, the use of fuel additives and the catalyst-coated particulate filter. In the context of NOx reduction strategies, "regeneration" means the desorption and reduction of NOx from NOx adsorbers (or NOx traps) during rich operation conditions.

(23)~~(21)~~ "Revoke" means to cancel the verification status of a diesel emission control strategy. If a diesel emission control strategy's verification status is revoked by the Executive Officer, the applicant must immediately cease and desist selling the diesel emission control strategy to end-users.

~~(22) "Stationary Diesel Fueled Diesel Engine" means either a diesel fueled diesel engine that is used in a piece of equipment that is designed to remain in one location for the duration of its useful life, or a diesel fueled diesel engine that is used in a piece of equipment that can be moved from~~

~~one location to another but remains in a single location for more than 12 consecutive months. Examples of stationary applications include, but are not limited, to electric power generator sets, grinders, rock crushers, sand screeners, cranes, cement blowers, compressors, and water pumps. The definitions in Title 13 California Code of Regulations Section 2452(g) and Section 2452(x) are incorporated by reference herein.~~

(24) "Stationary Engine" means an engine that is designed to stay in one location, or remains in one location. An engine is stationary if any of the following are true:

(A) The engine or its replacement is attached to a foundation, or if not so attached, will reside at the same location for more than 12 consecutive months. Any engine that replaces engine(s) at a location, and is intended to perform the same or similar function as the engine(s) being replaced, will be included in calculating the consecutive time period. In that case, the cumulative time of all engine(s), including the time between the removal of the original engine(s) and installation of the replacement engine(s), will be counted toward the consecutive time period; or

(B) The engine remains or will reside at a location for less than 12 consecutive months if the engine is located at a seasonal source and operates during the full annual operating period of the seasonal source, where a seasonal source is a stationary source that remains in a single location on a permanent basis (at least two years) and that operates at that single location at least three months each year; or

(C) The engine is moved from one location to another in an attempt to circumvent the residence time requirements [Note: The period during which the engine is maintained at a storage facility shall be excluded from the residency time determination.] The definitions in Title 13 California Code of Regulations Section 2452(g) and Section 2452(x) are incorporated by reference herein.

(25)~~(23)~~ "Verification" means a determination by the Executive Officer that a diesel emission control strategy meets the requirements of this Procedure. This determination is based on both data submitted or otherwise known to the Executive Officer and engineering judgement.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600, and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, and 43204-43205.5 Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

§ 2702. Application Process

* * * * *

(b) Proposed Verification Testing Protocol. Before formally submitting an application for the initial verification of a diesel emission control strategy, the applicant must submit a proposed verification testing protocol at the Executive Officer's discretion. The Executive Officer shall use the information in the proposed protocol to help determine whether the strategy relies on sound principles of science and engineering to control emissions, the need for additional analyses, and the appropriateness of allowing alternatives to the prescribed requirements. The protocol should include the following information:

(1) Identification of the contact persons, phone numbers, names and addresses of the responsible party proposing to submit an application.

(2) Description of the diesel emission control strategy's principles of operation. A schematic depicting operation should be included as appropriate. It is the responsibility of the applicant to demonstrate that its product relies on sound principles of science and engineering to achieve emission reductions.

(A) If, after reviewing the proposed protocol, the Executive Officer determines that the applicant has not made a satisfactory demonstration that its product relies on sound principles of science and engineering to achieve emission reductions, the Executive Officer shall notify the applicant of the determination in writing. The applicant may choose to withdraw from the verification process or submit additional materials and clarifications. The additional submittal must be received by the Executive Officer no later than 60 days from the date of the notification letter or the application may be suspended.

(B) If, after reviewing the additional submittal, the Executive Officer determines that the applicant has not yet made a satisfactory demonstration that its product relies on sound principles of science and engineering to achieve emission reductions, the application shall be suspended. If an application has been suspended, it may only be reactivated at the discretion of the Executive Officer.

(C) If at any time, the Executive Officer has reason to doubt the scientific or engineering soundness of a product, the Executive Officer may require the applicant to submit additional supporting materials and clarifications no later than 60 days from the date of the notification letter. If the additional submittal is not received by the Executive Officer by the deadline established in the notification letter, the application may be suspended or the existing verification may be revoked. In deciding whether to suspend an application or revoke an existing verification the Executive Officer will review submittals as provided in subsection (B) above.

(3) Preliminary parameters for defining emission control groups that are appropriate for the diesel emission control strategy. The Executive Officer

will work with the applicant to determine appropriate emission control group parameters.

(4) The applicant's plan for meeting the requirements of Sections 2703-2706. Existing test data may be submitted for the Executive Officer's consideration. The protocol must focus on verification of the diesel emission control strategy for use with a single emission control group.

(5) A brief statement that the applicant agrees to provide a warranty pursuant to the requirements of Section 2707.

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NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600, and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, and 43204-43205.5 Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

§ 2703. Emission Testing Requirements.

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(e) Test Cycle.

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(2) Off-road Engines and Equipment (including portable engines). For off-road diesel-fueled vehicles and equipment, the applicant must follow the steady-state test ~~cycle~~ procedure outlined in the ARB off-road regulations (California Code of Regulations, Title 13, Section 2423 and the incorporated California Exhaust Emission Standards and Test Procedures for New 2000 and Later Off-Road Compression-Ignition Engines, Part I-B). A minimum of three hot-start tests must be conducted using the specified ~~for each appropriate~~ test cycle. Applicants may request that the Executive Officer consider alternative test cycles, as described in subsection (f).

(3) Stationary Engines. For stationary engines, the applicant must follow the steady-state test procedure outlined in the ARB off-road regulations ~~use the most appropriate off-road test cycle~~ (as referenced in (2) above). ~~representing the operating conditions of the application, with approval from the Executive officer.~~ A minimum of three hot-start tests must be conducted using the specified ~~for each appropriate~~ test cycle. Applicants may request that the Executive Officer consider alternative test cycles and methods, as described in subsection (f).

(f) Alternative Test Cycles and Methods. The applicant may request the Executive Officer to approve an alternative test cycle or method in place of a required test cycle or method. In reviewing this request, the Executive Officer may consider all relevant information including, but not limited to, the following:

(1) Test procedures specified in airborne toxic control measures adopted by the ARB, e.g. the Airborne Toxic Control Measure for Stationary Compression Ignition Engines,
(2) Similarity of average speed, percent of time at idle, average acceleration, and other characteristics to the specified test cycle or method and in-use duty cycle,
(3) Body of existing test data generated using the alternative test cycle or method,
(4) Technological necessity, and
(5) Technical ability to conduct the required test.

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NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600, and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, and 43204-43205.5, Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

§ 2704. Durability Testing Requirements

* * * * *

Table 3. Minimum Durability Demonstration Periods

Engine Type	Minimum Durability Demonstration Period
On-Road	50,000 miles or 1000 hours
Off-Road (including portable engines) and Stationary	1000 hours
~~Stationary emergency generator~~ Stationary Emergency Standby Engines	500 hours

* * * * *

(g) Test Run. The requirements for emissions reduction testing are summarized in Table 4, below.
(1) The diesel emission control strategy must undergo one set of emission tests before beginning and after completion of the service accumulation. Baseline testing with test repetitions as indicated in Table 4 must be conducted for either the initial test or the final test, but is suggested for

both. If there are substantial test data from previous field studies or field demonstrations, applicants may request that the Executive Officer consider these in place of the initial emission tests.

(2) As an alternative to testing a single unit before and after the service accumulation period, the applicant may request that the Executive Officer consider the testing of two identical units, one that has been pre-conditioned and another that has completed the service accumulation period. In reviewing the request, the Executive Officer may consider all relevant information, including, but not limited to, the following:

(A) The effect of the diesel emission control strategy on engine operation over time. Strategies that cause changes in engine operation are likely not to qualify for this testing option.

(B) The quality of the evidence the applicant can provide to support that the two units are identical.

(C) Previous experience with similar or related technologies, and

(D) Whether the applicant is participating in the U.S. EPA verification process and has made an agreement with U.S. EPA to test two units.

(3) For strategies that include exhaust aftertreatment, engine backpressure and exhaust temperature must be measured and recorded on a second-by-second basis (1 Hertz) during at least one baseline run and each of the control test runs.

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NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600, and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, and 43204-43205.5 Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

§ 2705. Field Demonstration Requirements.

* * * * *

(b) Test Period.

(1) For on- and off-road engines, and stationary engines not used in emergency generators, a vehicle or piece of equipment must be operated with the diesel emission control strategy installed for a minimum period of 200 hours or 10,000 miles, whichever occurs first.

(2) For stationary emergency ~~generators~~ standby engines, the emission control system must remain in the field for at least 30 days and operation must include:

(A) 12 maintenance runs (allowing for engine cool down between runs), and

(B) a minimum of two separate 4 hour sessions where the engine is operated under load (allowing engine cool down between runs).

* * * * *

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600, and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, and 43204-43205.5 Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

§ 2706. Other Requirements.

(a) Limit and Procedure for Measuring Nitrogen Dioxide (NO_2).

(1) The post-control NO_2 emissions must not exceed 20 percent of the total baseline (pre-control) NOx emissions on a mass basis, from the same test cycle(s) for emission testing from Section 2703 (e). This limit takes effect beginning on January 1, 2007~~2004~~. Diesel emission control strategies verified and installed prior to January 1, 2007~~2004~~ are exempted from this requirement. Those verified prior to January 1, 2007~~2004~~ will no longer be allowed for installation after January 1, 2007~~2004~~ unless they meet the NO_2 emission limit. After January 1, 2007~~2004~~, all diesel emission control strategies verified and installed must meet this requirement.

(2) NO_2 emissions are to be quantified by one of the following methods:

(A) Two chemiluminescence analyzers,

(B) A dual-path chemiluminescence analyzer, or

(C) An alternative method approved by the Executive Officer.

(3) For (2)(A) and (2)(B), the analyzers are to be fed from a heated and conditioned sample path. If two chemiluminescence analyzers are employed, they are to be simultaneously fed from a common heated sample path. One instrument (or path) shall be set to NOx mode, while the second shall be set to nitric oxide (NO) mode. The instrument (or path) set to NOx mode receives a sample that has passed through an NO_2-to-NO converter, and the resultant concentration is designated as total NOx ($NO+NO_2$) in the sample. The instrument (or path) that is set to NO mode receives a sample that has not passed through the converter and quantifies the amount of NO only. The difference between NO and NOx is the amount of NO_2 in the sample. Both NO and NOx signals are recorded by an external data acquisition system at 1 Hertz. ~~The column data for each NO and NOx signal is then adjusted for time delays that are inherent in both the instruments and the sample paths. Once the data file is aligned, a subtraction of NO from NOx is performed on a second by second basis. The result of this subtraction is then integrated over the entire test run. The result of this integration is the amount of NO_2 over the entire test cycle in parts per million (ppm).~~ Using the average concentrations of NO and NOx over the entire test cycle, the conventional ~~The~~ equation for calculating total NOx (Code of Federal Regulations, Title 40, part 86, Subpart N) is then used to generate a gram per mile or g/bhp-

hr ~~NO_2~~ value for both NO and NOx. The resulting value for NO is then subtracted from that for NOx to determine the gram per mile or g/bhp-hr value for NO_2. The instrument for measuring NO and NOx must be calibrated in accordance with the NOx calibration procedure as described in the Code of Federal Regulations, Title 40, part 86, Subpart N.

(4) Alternative Method to Measure NO_2. The applicant may request the Executive Officer to approve an alternative method in place of the required methods. In reviewing this request, the Executive Officer may consider all relevant information including, but not limited to, the following:

(A) Correlation of the alternative method with the methods stated in 2(A) or 2(B).

(B) Body of existing data generated using the alternative method.

(b) Limits on Other Pollutants

* * * * *

(2) Limit on CO.

(A) On-road and Off-road (including portable) Engines. In order for a diesel emission control strategy to be verified, the diesel emission control strategy must not increase the emissions of CO greater than the current CO emission standards for new diesel engines adopted by the Air Resources Board and in effect at the time of verification.

(B) Stationary Engines. In order for a diesel emission control strategy to be verified, the diesel emission control strategy must not increase the emissions of CO by more than 10 percent of the baseline emissions level as reported under Section 2708(a).

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NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600, 43700, and 43830.8 Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, and 43204-43205.5 Health and Safety Code; Section 71017, Public Resources Code; and Title 17 California Code of Regulations Section 93000.

§ 2707. Warranty Requirements.

(a) (1) Product Warranty.

(A) The applicant must warrant to all owners, for ownership within the warranty period and lessees, for lease contract within the warranty period, that its verified diesel emission control strategy is free from defects in design, materials, workmanship, or operation of the diesel emission control strategy which cause the diesel emission control strategy to fail to conform to the emission control performance level it

was verified to, or to the other requirements of Sections 2700-2706, and 2710 for the minimum periods shown in Table 5, provided the operation of and conditions of use for the vehicle, equipment, engine, and diesel emission control strategy conform with the operation and conditions specified in the ARB's Executive Order.

(B) For each engine type and size listed in Table 5, the minimum defects warranty period is terminated by that listed event which occurs first. The warranty must cover the full repair or replacement cost of the diesel emission control strategy, including parts and labor.

(C)The warranty must also cover the full repair or replacement cost of ~~to~~ returning ~~the vehicle, equipment, or~~ engine components to the condition they were in prior to the failure, including parts and labor, for damage to the engine ~~or other vehicle components~~ proximately caused by the verified diesel emission control strategy. Repair or replacement of any warranted part, including the engine ~~and other parts~~, must be performed at no charge to the vehicle or engine owner. This includes only those relevant diagnostic expenses in the case in which a warranty claim is valid. The applicant may, at its option, instead pay the fair market value of the ~~vehicle, equipment, or~~ engine prior to the time the failure occurs.

(D)The repair or replacement of any warranted part otherwise eligible for warranty coverage, may be excluded from such warranty coverage at the applicant's discretion if the applicant demonstrates that the diesel emission control strategy, vehicle or engine has been abused, neglected, or improperly maintained, and that such abuse, neglect, or improper maintenance was the direct cause of the need for the repair or replacement of the part.

(E) Failure of the vehicle or engine owner to ensure scheduled maintenance or to keep maintenance records for the vehicle, equipment, engine, or diesel emission control strategy may, but shall not per se, be grounds for disallowing a warranty claim.

(2) Installation Warranty

(A) A person or company who installs a verified diesel emission control strategy must warrant that the installation is free from defects in workmanship or materials which cause the diesel emission control strategy to fail to conform to the emission control performance level it was verified to or the other requirements of sections 2700-2706 for the minimum time periods shown in Table 5.

(B) For each engine type and size listed in Table 5, the minimum defects warranty period is terminated by that listed event whichever occurs first. The extent of the warranty coverage provided by installers must be the same as the warranty provided by the applicant as established in subsection (a)(1) and the same exclusions must apply.

Table 5. Minimum Warranty Periods

Engine Type	Engine Size	Minimum Warranty Period
On-Road	Light heavy-duty, 70 to 170 hp, Gross Vehicle Weight Rating (GVWR) less than 19,500 lbs.	5 years or 60,000 miles
	Medium heavy-duty, 170 to 250 hp, GVWR from 19,500 lbs. to 33,000 lbs.	5 years or 100,000 miles
	Heavy heavy-duty, exceeds 250 hp, GVWR exceeds 33,000 lbs.	5 years or 150,000 miles
Off-Road (includes portable engines) and Stationary	Under 25 hp, and for constant speed engines rated under 50 hp with rated speeds greater than or equal to 3,000 rpm	3 years or 1,600 hours
	At or above 25 hp and under 50 hp	4 years or 2,600 hours
	At or above 50 hp	5 years or 4,200 hours

(b)(1) Product Warranty Statement. The applicant must furnish a copy of the following statement in the owner's manual.

YOUR WARRANTY RIGHTS AND OBLIGATIONS

(Applicant's name) must warrant the diesel emission control system in the application for which it is sold or leased to be free from defects in design, materials, workmanship, or operation of the diesel emission control system which cause the diesel emission control system to fail to conform to the emission control performance level it was verified to, or to the requirements in the California Code of Regulations, Title 13, Sections 2700 to 2706, and 2710, for the periods of time listed below, provided there has been no abuse, neglect, or improper maintenance of your diesel emission control system, vehicle or equipment, as specified in the owner's manuals. Where a warrantable condition exists, this warranty also covers the engine ~~other vehicle or equipment parts~~ from damage caused by the diesel emission control system, subject to the same exclusions for abuse, neglect or improper maintenance of your vehicle or equipment. Please review your owner's manual for other warranty information. Your diesel emission control system may include a core part (e.g., particulate filter, diesel oxidation catalyst, selective catalytic reduction converter) as well as hoses, connectors, a back pressure monitor (if applicable), and other emission-related assemblies. Where a warrantable condition exists, (applicant's name) will repair or replace your diesel emission control system at no cost to you including diagnosis, parts, and labor.

WARRANTY COVERAGE:

For a (engine size) engine used in a(n) (type of application) application, the warranty period will be (years or hours or miles of operation) whichever occurs first. If any emission-related part of your diesel emission control system is defective in design, materials, workmanship, or operation of the diesel emission control system thus causing the diesel emission control system to fail to conform to the emission control performance level it was verified to, or to the requirements in the California Code of Regulations, Title 13, Sections 2700 to 2706, and 2710, within the warranty period, as defined above, (Applicant's name) will repair or replace the diesel emission control system, including parts and labor.

In addition, (applicant's name) will replace or repair the ~~vehicle, equipment, or~~ engine components to the condition they were in prior to the failure, including parts and labor, for damage to the engine ~~or other vehicle components~~ proximately caused by the verified diesel emission control strategy. This also includes those relevant diagnostic expenses in the case in which a warranty claim is valid. (Applicant 's name) may, at its option, instead pay the fair market value of the ~~vehicle, equipment, or~~ engine prior to the time the failure occurs.

OWNER'S WARRANTY RESPONSIBILITY

As the (vehicle, engine, equipment) owner, you are responsible for performing the required maintenance described in your owner's manual. (Applicant's name) recommends that you retain all maintenance records and receipts for maintenance expenses for your vehicle, engine, or equipment, and diesel emission control system. If you do not keep your receipts or fail to perform all scheduled maintenance, (applicant's name) may have grounds to deny warranty coverage. You are responsible for presenting your vehicle, equipment, or engine, and diesel emission control system to a (applicant's name) dealer as soon as a problem is detected. The warranty repair or replacement should be completed in a reasonable amount of time, not to exceed 30 days. If a replacement is needed, this may be extended to 90 days should a replacement not be available, but must be performed as soon as a replacement becomes available.

If you have questions regarding your warranty rights and responsibilities, you should contact (Insert chosen applicant's contact) at 1-800-xxx-xxxx or the California Air Resources Board at 9528 Telstar Avenue, El Monte, CA 91731, or (800) 363-7664, or electronic mail: helpline@arb.ca.gov.

~~(b)~~(2) Installation Warranty Statement. The installer must furnish the owner with a copy of the following statement.

YOUR WARRANTY RIGHTS AND OBLIGATIONS

(Installer's name) must warrant that the installation of a diesel emission control system is free from defects in workmanship or materials which cause the diesel emission control system to fail to conform to the emission control performance level it was verified to, or to the requirements in the California Code of Regulations, Title 13, Sections 2700 to 2706. The warranty period and the extent of the warranty coverage provided by (installer's name) must be the same as the warranty provided by the product manufacturer, and the same exclusions must apply.

OWNER'S WARRANTY RESPONSIBILITY

As the vehicle, engine, or equipment owner, you are responsible for presenting your vehicle, engine, or equipment, and diesel emission control system to (installer's name) as soon as a problem with the installation is detected.

If you have questions regarding your warranty rights and responsibilities, you should contact (Insert chosen installer's contact) at 1-800-xxx-xxxx or the California Air Resources Board at 9528 Telstar Avenue, El Monte, CA 91731, or (800) 363-7664, or electronic mail: helpline@arb.ca.gov.

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NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600, and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, and 43204-43205.5 Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

TITLE 17. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER THE ADOPTION OF A PROPOSED AIRBORNE TOXIC CONTROL MEASURE FOR PORTABLE DIESEL-FUELED ENGINES

The Air Resources Board (ARB or Board) will conduct a public hearing at the time and place noted below to consider adopting an airborne toxic control measure (ATCM) to reduce public exposure to diesel particulate matter (PM) emitted from portable diesel-fueled engines (proposed ATCM).

DATE: February 26, 2004

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Central Valley Auditorium, Second Floor
1001 I Street
Sacramento, California 95814

This item will be considered at a two-day meeting of the ARB, which will commence at 9:00 a.m., on February 26, 2004, and may continue at 8:30 a.m., on February 27, 2004. This item may not be considered until February 27, 2004. Please consult the agenda for the meeting, which will be available at least 10 days before February 26, 2004, to determine the day on which this item will be considered.

If you have special accommodation or language needs, please contact the ARB's Clerk of the Board at (916) 322-5594 or sdorais@arb.ca.gov as soon as possible. TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed adoption of sections 93116, 93116.1, 93116.2, 93116.3, 93116.4, and 93116.5, title 17, California Code of Regulations (CCR).

Background: In 1998 the Board identified diesel PM emissions from diesel-fueled engines as a toxic air contaminant (TAC). In September 2000, the Board approved the Diesel Risk Reduction Plan, which outlined steps that would be taken to reduce diesel emissions from both new and existing diesel-fueled engines and vehicles, including portable engines. The ultimate goal of the Diesel Risk Reduction Plan is to reduce California's diesel PM emissions and associated cancer risks by 85 percent by 2020.

Unlike stationary engines, portable engines may be moved readily from one location to another. The engines are used to power a variety of equipment, including pumps

(e.g., agricultural irrigation pumps and other water pumps), ground support equipment at airports, cranes, oil-well drilling and workover rigs, power generators, dredging equipment, rock crushing and screening equipment, welding equipment, woodchippers, and compressors. Portable diesel engines emit approximately 1,500 tons per year of diesel PM. These engines are distributed throughout California, and many are located in urban centers where the population is exposed to diesel PM emissions.

The proposed ATCM is designed to minimize the public's exposure to diesel PM emitted from diesel-fueled portable engines. Health and Safety Code (H&SC) sections 39666 and 39667 require the ARB to adopt regulations to achieve the maximum possible reduction in public exposure to TACs through the application of best available control technology (BACT), or a more effective control method, in consideration of cost, risk, environmental impacts, and other specified factors.

Furthermore, the Children's Environmental Health Protection Act (Stats. 1999, Ch. 731) requires the California Environmental Protection Agency to specifically consider children in setting Ambient Air Quality Standards and in developing criteria for TACs. The Office of Environmental Health Hazard Assessment (OEHHA) identified diesel PM and several other TACs associated with motor vehicle exhaust among the top priority pollutants affecting children's health.

The ARB staff has prepared an Initial Statement of Reasons (ISOR) for the proposed ATCM that, together with the needs assessment (Diesel Risk Reduction Plan), serves as the report on the need and appropriate degree of regulation for diesel-fueled portable engines.

EXISTING FEDERAL AND STATE REGULATIONS

There are no federal regulations that are comparable to the proposed ATCM. However, since January 1, 1996, new portable engines sold in California have been subject to ARB's Off-Road Compression Ignition emission standards (title 13, CCR, sections 2320 et seq.), which are equivalent to the United States Environmental Protection Agency (U.S. EPA) emission standards for newly manufactured nonroad engines (40 CFR, Part 89). There are currently three tiers of standards; Tier 1, 2, and 3. The U.S. EPA proposed Tier 4 emission standards in April 2003, which will, if adopted, require most engines to meet more stringent emission limits in the 2011-2014 timeframe.

The ARB currently administers a Statewide Portable Equipment Registration Program (PERP; title 13, CCR, sections 2450-2466) that allows portable-engine owners to voluntarily register their engines with the State in lieu of obtaining operating permits from the local air pollution control and air quality management districts (districts). By January 1, 2010, only engines certified to U.S. EPA/ ARB off-road engine emission standards (Tier 1, 2, or 3) can be registered under PERP.

Description of the Proposed Regulatory Action

Applicability and Requirements

The proposed ATCM would affect all diesel-fueled portable engines that are larger than 50 horsepower (hp). The proposed ATCM would require all portable engines to be certified to Tier 1, 2, or 3 U.S. EPA/ARB off-road engine standards by 2010, as is currently required for engines registered in the PERP. After 2010, it would require all fleets of portable engines to meet diesel PM emission averages that become more stringent in 2013, 2017, and 2020. The owners/operators of these fleets will have flexibility in determining how the fleet emission standards are to be satisfied. Options that are available to satisfy this standard include replacing engines, using add-on control devices, switching to alternative fuels or alternative diesel fuels, and receiving credit for electrification. By 2020, the proposed ATCM would require diesel-fueled portable engines to either:

1) be certified to Tier 4 emission standards for newly manufactured off-road engines; or
2) be equipped with a diesel PM control technology that has been verified by the ARB under it's Verification Procedure for diesel PM control technologies (title 13, CCR sections 2700-2710) to reduce diesel PM emissions by 85 percent (Level-3 Verification), or equipped with a combination of verified control technologies that cumulatively achieve 85 percent diesel PM reduction.

Fleet Requirements

In addition to the requirements outlined above, portable engines will be subject to the following fleet weighted standards starting in 2013 and becoming progressively more stringent in 2017 and 2020. Fleet weighted diesel PM standards are proposed for engines less than 175 horsepower (hp), engines between 175 hp and 749 hp, and engines greater than or equal to 750 hp.

Fleet Standard Compliance Date	Diesel PM Standard (g/bhp-hr) for Engines <175 hp	Diesel PM Standard (g/bhp-hr) for Engines 175 hp to 749 hp	Diesel PM Standard (g/bhp-hr) for Engines ≥ 750 hp
1/1/13	0.3	0.15	0.25
1/1/17	0.18	0.08	0.08
1/1/20	0.04	0.02	0.02

Owners of portable engine fleets will determine compliance with the proposed fleet standard by comparing the fleet's actual weighted diesel PM emission rate with the fleet emission standard.

Engines that are used exclusively in emergency applications or meet the requirements for low-use engines must be certified to U.S. EPA/ARB off-road engine standards by

2010 but are not subject to the fleet emission standards in 2013 or 2017. These engines would be required by January 1, 2020, to be certified to Tier 4 engines standards, or be equipped with a Level-3 diesel PM control technology, or a combination of verified control technologies to achieve a 85 percent diesel PM reduction.

Incentives

The proposed ATCM provides several incentives to encourage repowering or replacement of older engines with new, lower-emitting engines as part of the fleet reduction approach. Credits are being proposed for satisfying a fleet standard for adding alternative-fueled engines to the fleet, replacing diesel-fueled engines with electrification, and early replacement of older engines with Tier 4 engines.

Recordkeeping and Reporting Requirements

Specific recordkeeping requirements address only those engines in a fleet whose use is based on hourly limitations, fleets taking advantage of the electrification incentive, and engines equipped with Selective Catalytic Reduction (SCR). All fleet owners will have to submit a status report to the ARB by March 1, 2011, that includes the fleet's average diesel PM emission rate for the 2010 calendar year, information identifying each engine in the fleet, and each engine's emission rate. In addition, fleet owners must submit signed statements of compliance and corroborating data indicating that they are meeting the fleet standards by March 1 of each applicable year (i.e., 2013, 2017, 2020).

Exemptions

Engines that would be exempt from the proposed ATCM include: engines less than or equal to 50 hp, engines used to propel mobile equipment or motor vehicle; portable equipment that is owned by the United States Department of Defense and used in combat, combat support, tactical or relief operations, or training for such operations (military tactical support equipment); and portable engines used at San Clemente or San Nicolas Island.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

The Board staff has prepared an ISOR for the proposed regulatory action, which includes a summary of the potential environmental and economic impacts of the proposal, if any. The ISOR is entitled, "Staff Report: Initial Statement of Reasons for the Proposed Airborne Toxic Control Measure for Diesel Particulate Matter from Portable Engines Greater Than 50 Horsepower."

Copies of the ISOR and the full text of the proposed regulatory language may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, CA 95814, (916) 322-2990, at least 45 days prior to the scheduled hearing, which will begin on February 26, 2004.

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons in this notice, or may be accessed on the ARB's web site listed below.

Inquiries concerning the substance of the proposed regulations may be directed to the designated agency contact persons, Mike Waugh, Manager of the Program Assistance Section, at (916) 445-6018, or by email at mwaugh@arb.ca.gov, or Grant Chin, Staff Air Pollution Specialist, at (916) 327-5602, or by email at gchin@arb.ca.gov.

Further, the agency representative and designated back-up contact persons to whom nonsubstantive inquiries concerning the proposed administrative action may be directed are Artavia Edwards, Manager, Board Administration & Regulatory Coordination Unit, (916) 322-6070, and Alexa Malik, Regulations Coordinator, (916) 322-4011. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

If you are a person with a disability and desire to obtain this document in an alternative format, please contact the ARB's Clerk of the Board at (916) 322-5594 or sdorais@arb.ca.gov as soon as possible. TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service

This notice, the ISOR and all subsequent regulatory documents, including the FSOR, when completed are available on the ARB Internet site for this rulemaking at http://www.arb.ca.gov/regact/porteng/porteng.htm

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies and private persons and businesses in reasonable compliance with the proposed regulations are presented below.

Pursuant to Government Code section 11346.5(a)(5), the Executive Officer has determined that the proposed regulations will possibly impose a mandate on local agencies. The Executive Officer has further determined pursuant to Government Code section 11346.5(a)(6) that the proposed regulations will result in some additional costs to the Air Resources Board and other state agencies. In addition, the Executive Officer has also determined pursuant to Government Code section 11346.5(a)(6) that the proposed regulatory action will possibly create a cost to local agencies that are required to be reimbursed under Part 7 (commencing with section 17500) of division 4 of the Government Code or other nondiscretionary costs or savings imposed on local agencies. The Executive Officer further determines that the proposed regulations will result in some additional cost to federal agencies in the state.

The Executive Officer has made an initial determination that the proposed regulatory action will not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

The Executive Officer has determined that the total lifetime cost of the proposed ATCM to affected businesses will vary between $290 and $340 million, in 2002 expenditure equivalent dollars. This value represents the total cost of the regulation if all money required to comply with the proposed ATCM were spent today. On an annual basis, the cost will vary between $2 to $29 million per year, averaging $12 million per year. The total cost to a typical business (a fleet of fifteen engines), including capital and ongoing costs, is estimated to be between $226,000 and $238,000, in 2002 expenditure equivalent dollars. Annual costs would vary between $1,500 and $17,000 per year, with an average cost of $8,200 per year.

The Executive Officer has determined, pursuant to title 1, CCR, section 4, that the proposed regulatory action will have some impact on small businesses. The ARB staff believes that approximately 10 percent of portable engines are owned by small businesses. The ARB staff estimates that the total cost, including capital and ongoing costs, to a typical small business (a fleet of five or less engines) to be between $30,000 and $38,000, in 2002 expenditure equivalent dollars. Annual costs would vary between $400 and $5,200 per year, with an average cost of $2,000 per year.

In developing this regulatory proposal, the ARB staff evaluated the potential economic impacts on representative private persons or businesses. The ARB is not aware of any cost impacts that a representative private person or business would necessarily incur in reasonable compliance with the proposed action.

In accordance with Government Code sections 11346.3 and 11346.5(a)(10), the Executive Officer has determined that the proposed regulatory action may lead to creation or elimination of some businesses, the creation of new businesses or elimination of existing businesses within the State of California, or the expansion of businesses currently doing business within the State of California. Due to the long lead-time for compliance, we believe that most businesses will be able to absorb the compliance costs. However, it is possible that a small number of businesses (those with marginal profitability) may experience financial difficulty in complying with the regulation. Businesses that may be created in the short term include those that package engines and install engines. In the long term, engine manufacturers and businesses that sell and maintain diesel emission control systems are likely to see an increase in business due to early engine replacement and other options available to meet the proposed diesel PM standard requirements. In addition, the cost of complying with the proposed ATCM may encourage some fleet owners to replace engines with rented engines, which could lead to an increase of engine rental businesses.

The Executive Officer has determined the total capital outlay for complying with the proposed ATCM for local agencies will be between $102 million and $147 million, in

2002 expenditure equivalent dollars. Annual outlay will vary between $2 million and $13 million. The initial outlay will not be necessary until fiscal year 2008-2009. These costs are not reimbursable state mandated costs pursuant to part 7 (commencing with section 17500), division 4, title 2 of the Government Code because most, if not all, of these agencies are authorized to collect fees to recoup their costs under section 17500 et seq. of the Government Code, and the ATCM applies to all entities that own or operate portable engines and, therefore does not impose unique requirements on local government agencies.

The Executive Officer has also determined that the total cost for complying with the proposed ATCM for State agencies will be between $7 million and $11 million, in 2002 expenditure equivalent dollars. Annual outlay will vary between $0.1 million and $1 million. Initial outlay will not be necessary until fiscal year 2008-2009. Given the current fiscal and economic conditions, the Executive Officer cannot determine with certainty whether State agencies will be able to absorb these additional costs within current or future budgets, but it is anticipated that the agencies will be able to absorb annualized costs of this magnitude, given the extended period allowed for compliance.

The Executive Officer has also determined that the total cost for complying with the proposed ATCM for federal agencies will be between $2.0 million and $2.9 million, in 2002 expenditure equivalent dollars. Annual outlay will vary between $30,000 and $250,000. Initial outlay will not be necessary until fiscal year 2008-2009.

The Executive Officer has determined that individual local air districts may incur some permitting and enforcement costs as a result of implementing the proposed ATCM. However, the costs incurred by the air districts should be recovered through permit fees or fees imposed under the Statewide Portable Equipment Registration Program.

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the Executive Officer has found that the reporting requirements of the regulation that apply to businesses are necessary for the health, safety, and welfare of the people of the State of California.

In accordance with H&SC section 43013(c), the Executive Officer has determined that the standards and other requirements in the proposed ATCM are necessary, cost-effective, and technologically feasible for agricultural operations (i.e., farm equipment).

A detailed assessment of the economic impacts of the proposed regulatory action can be found in the ISOR.

Consideration of Alternatives

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the agency or that has otherwise been identified and brought to the attention of the agency would be more effective in carrying

out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action.

SUBMITTAL OF COMMENTS

The public may present comments relating to this matter orally or in writing at the hearing, and in writing or by e-mail before the hearing. To be considered by the Board, written submissions not physically submitted at the hearing must be received **no later than 12:00 noon, February 25, 2004**, and addressed to the following:

Postal mail is to be sent to:

Clerk of the Board
Air Resources Board
1001 I Street, 23rd Floor
Sacramento, California 95814

Electronic mail is to be sent to: porteng@listserv.arb.ca.gov, and received at the ARB **no later than 12:00 noon, February 25, 2004**.

Facsimile submissions are to be transmitted to the Clerk of the Board at (916) 322-3928 and received at the ARB **no later than 12:00 noon, February 25, 2004**.

The Board requests but does not require 30 copies of any written submission. Also the ARB requests that written, facsimile, and e-mail statements be filed at least 10 days prior to the hearing so that ARB staff and Board Members have time to fully consider each comment. The ARB encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under the authority granted to the ARB in Health and Safety Code sections 39600, 39601, 39650, 39658, 39659, 39665, 39666, 41511, 41752, 43013, and 43018. This action is proposed to implement, interpret, or make specific Health and Safety Code sections 39002, 39650, 39658, 39659, 39665, 39666, 40000, 41511, 41752, 43013, and 43018.

HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340) of the Government Code.

Following the public hearing, the ARB may adopt the regulatory language as originally proposed or with non-substantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice that the regulatory language as modified could result from the proposed regulatory action. In the event that such modifications are made, the full regulatory text, with the modifications clearly indicated, will be made available to the public for written comment at least 15 days before it is adopted.

The public may request a copy of the modified regulatory text from the ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, California 95814, (916) 322-2990.

CALIFORNIA AIR RESOURCES BOARD

Michael P. Schaub

for Catherine Witherspoon
Executive Officer

Date: 12/30/2003

"The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our Web-site at www.arb.ca.gov."

State of California
AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

Public Hearing to Consider

ADOPTION OF THE PROPOSED AIRBORNE TOXIC CONTROL MEASURE FOR DIESEL PARTICULATE MATTER FROM PORTABLE ENGINES GREATER THAN 50 HORSEPOWER

To be considered by the Air Resources Board on February 26, 2004 at:

California Environmental Protection Agency
Headquarters Building
1001 "I" Street
Central Valley Auditorium
Sacramento, California

This report has been prepared by the staff of the California Air Resources Board. Publication does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

State of California
AIR RESOURCES BOARD

PROPOSED AIRBORNE TOXIC CONTROL MEASURE FOR DIESEL PARTICULATE MATTER FROM PORTABLE ENGINES GREATER THAN 50 HORSEPOWER

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January 2004

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Executive Summary

A. INTRODUCTION

The Air Resources Board (ARB or Board) staff is proposing an air toxic control measure (proposed ATCM) to reduce the emissions of diesel particulate matter (PM) from diesel-fueled portable engines. This proposed ATCM is one element in the implementation of ARB's "Risk Reduction Plan to Reduce PM Emissions from Diesel-Fueled Engines and Vehicles" (Diesel Risk Reduction Plan).

Diesel exhaust is a complex mixture of thousands of gases and fine particles that contains more than 40 identified toxic air contaminants. These include many known or suspected cancer-causing substances, such as benzene, arsenic and formaldehyde. Diesel exhaust can irritate the eyes, nose, throat and lungs, and it can cause coughs, headaches, light-headedness and nausea. Diesel exhaust is a major source of ambient particulate matter pollution as well, and numerous studies have linked elevated particle levels in the air to increased hospital admission, emergency room visits, asthma attacks and premature deaths among those suffering from respiratory problems.

In August 1998, following a 10-year scientific assessment process, the ARB identified diesel PM as a Toxic Air Contaminant (TAC). Diesel PM is the number one contributor to total ambient air toxic risk in California due to the large number of diesel-fueled engines and the associated risk from these emissions. Diesel PM emissions are estimated to be responsible for about 70 percent of the total ambient air toxics risk in California. In September 2000, the Board approved the Diesel Risk Reduction Plan, which outlined steps that would be taken to reduce diesel emissions from both new and existing diesel-fueled engines and vehicles, including portable engines. The ultimate goal of the Diesel Risk Reduction Plan is to reduce California's diesel PM emissions and associated cancer risks by 85 percent by 2020.

Portable engines are engines that may be moved easily from location to location. The engines are used to power a variety of equipment, including: pumps, ground support equipment at airports, cranes, oil-well drilling and workover rigs, power generators, dredging equipment, rock crushing and screening equipment, welding equipment, woodchippers, and compressors.

The proposed ATCM will satisfy the requirements in the Diesel Risk Reduction Plan to reduce diesel PM emissions and associated risk from the use of diesel-fueled portable engines in California. The staff estimates that the proposed ATCM, when fully implemented in 2020, will reduce diesel PM emissions from portable engines by 95 percent from year 2000 emission levels. The proposed ATCM is one of several ATCMs considered by the Board in 2003 and 2004 to fulfill the goals of the Diesel Risk Reduction Plan. The other ATCMs

include measures to reduce diesel PM emissions from residential and commercial solid waste collection vehicles, stationary engines, and transport refrigeration units.

B. PORTABLE ENGINE USE AND CURRENT REGULATIONS

1. What types of businesses and public agencies use portable engines?

Both private businesses and public agencies operate portable engines in California and would be impacted by the proposed ATCM. Examples of businesses that would be affected include motion picture studios, amusement parks, air couriers, airlines, utilities, construction services, crushing, screening, and recycling services, industrial cleaning services, marine construction and dredging services, oil and gas companies, refineries, and rental services. A variety of public agencies would also be affected, including public schools and universities, local governments, county landfills, municipal utilities, wastewater treatment facilities, prisons, the California Department of Transportation, and other state agencies.

2. What regulations currently impact portable engines in California?

a. ARB/United States Environmental Protection Agency (U.S. EPA) off-road engine emission standards

Since January 1, 1996, new portable engines sold in California have been subject to ARB's Off-Road Compression Ignition emission standards, which are equivalent to the U.S. EPA emission standards for newly manufactured nonroad engines. The standards are tiered (i.e., Tier 1, 2, 3), with each set of standards more stringent than the previous set and, based on the power rating of the engine, phased in over several years. In 2006, new portable engines of all sizes will be subject to Tier 2 standards, and in 2008, new engines of all sizes will be subject to Tier 3 standards. Tier 4 emission standards were proposed by U.S. EPA in April 2003, and will, if adopted, require most engines to meet more stringent particulate matter (PM) and oxides of nitrogen (NOx) limits in the 2011-2014 timeframe.

b. Statewide Portable Equipment Registration Program

Several of the 35 air districts in California have rules that specifically pertain to portable engines. A portable-engine owner would have to obtain a permit from each of these individual districts prior to operating the engines in these districts. Instead of obtaining multiple permits from individual districts, a portable-engine owner can register the engine with ARB's Statewide Portable Equipment Registration Program (PERP). Portable engine owners have registered over 14,500 engines under PERP, which represents nearly half of the estimated

statewide inventory of portable engines. Most of the engines in PERP are diesel-fueled.

The PERP regulations were designed to promote the use of clean portable engines in California. By January 1, 2010, only engines certified to ARB/U.S. EPA off-road engine emission standards (Tier 1, 2, or 3) can be registered under PERP, meaning any engines currently in the program that do not meet at least Tier 1 standards must be replaced with certified engines by that date. By 2010, full implementation of the existing PERP requirements will result in reductions of diesel PM emissions from currently registered portable engines in the State by an estimated 30 percent. The proposed ATCM builds upon the success of the existing PERP to achieve additional diesel PM reductions. For example, one of the short-term goals of the proposed ATCM is to ensure that all portable engines in California are certified engines by 2010, the same requirement engines registered with the PERP program must satisfy.

c. Local air district permit programs

Several thousand portable engines that are not part of the PERP program are subject to local air district permitting requirements. The ARB staff estimates that there are approximately 3,000 portable engines in California that are permitted by the districts. District permit requirements vary, depending on the severity of the air quality in the district. Some districts may require engines to meet emission limits that are equivalent to Best Available Control Technology (BACT) emission limits. For some districts, BACT for portable engines means that the engine is certified to ARB/U.S. EPA off-road engine emission standards. Districts may also restrict the operating hours of portable engines to reduce the potential excess cancer risks caused by diesel PM emissions.

d. Engines not currently under permit

In addition to the 3,000 portable diesel engines currently permitted by the local air districts, ARB staff estimates that there are several thousand engines subject to permitting requirements that are neither permitted nor registered in PERP. The ARB will work with the local air districts to identify these engines and bring them into the regulatory process.

Additionally, there are portable engines that are currently exempt from local air district permitting requirements—due to size or application—that will be subject to the proposed ATCM and will therefore need to apply for permits or State registration. These engines will be identified and incorporated into the regulatory process.

3. What regulations currently impact diesel PM control technologies in California?

In March 2002, the Board adopted the "*Verification Procedure for In-Use Strategies to Control Emissions from Diesel Engines*" (Verification Procedure) to support the ARB's regulatory efforts to reduce diesel PM. The Verification Procedure establishes a process through which manufacturers of emission control equipment can demonstrate and verify the emission reduction capabilities of control technologies. Examples of emission control technologies that can be considered for verification include: diesel particulate filters, diesel oxidation catalysts, exhaust gas re-circulation, selective catalytic reduction systems, fuel additives and alternative diesel fuel systems. The Verification Procedure is voluntary and applies to emission control technologies for on-road, off-road and stationary applications. The multi-level verification system consists of three PM reduction levels that are illustrated in the following table.

Verification Classifications for Diesel Emission Control Strategies for PM

Pollutant	Reduction	Classification
PM	< 25 percent	Not Verified
	≥ 25 percent	Level 1
	≥ 50 percent	Level 2
	≥ 85 percent or 0.01 g/bhp-hr	Level 3

C. EMISSIONS AND HEALTH IMPACTS FROM DIESEL-FUELED PORTABLE ENGINES

1. What are the estimated emissions of diesel particulate matter from portable engines?

The ARB staff estimated the diesel PM emissions from portable engines by using the 2000 portable engine inventory and associated diesel PM emissions that were presented in the Diesel Risk Reduction Plan. Based on this inventory, staff estimates that there are 33,000 portable engines in California that emit a total of 4.2 tons per day or 1,533 tons per year of diesel PM, 67.1 tons per day of NOx and 6.7 tons per day of reactive organic gases (ROG).

2. What is the risk posed from diesel-fueled portable engines?

Exposure to diesel PM emissions results in increased cancer risk and health risks from other non-cancer health impacts, such as irritation to the eyes and lungs, allergic reactions in the lungs, asthma exacerbation, blood toxicity, immune system dysfunction, and developmental disorders. Because of the variability in the use of portable diesel-fueled equipment and the mobile nature of portable equipment, it is difficult to quantify the potential health risk resulting from the operation of a portable diesel-fueled engine on any specific receptor.

However, qualitative conclusions can be drawn regarding potential exposures to the emissions from diesel-fueled portable engines. Many Californians are impacted by diesel PM emissions from the operation of diesel-fueled engines. The emissions from these engines contribute toward the ambient concentration of diesel PM. Based upon the emissions inventory for diesel PM, portable diesel-fueled engines account for five percent of the ambient concentration. In addition, many of the engines are used in urban locations where the probability of a person living close to an engine is high.

The overall excess cancer risk can be significantly reduced by replacing older portable diesel-fueled engines with new, cleaner diesel-fueled engines. For example, if an older engine is replaced with a Tier 3 engine, the diesel PM emissions and associated risk would be reduced by 55 to 70 percent. Reductions of over 95 percent can be achieved if the older engine is replaced with a Tier 4 engine, which is proposed to be available in the 2011-2014 timeframe.

D. PUBLIC OUTREACH

1. What action did staff take to consult with interested parties during the development of the proposed ATCM?

The ARB staff developed the proposed ATCM and this report through extensive consultations with industry, government agency representatives, environmental organizations, and members of the public. In 2002, the ARB staff formed a Portable Diesel Engine workgroup to assist with the development of the proposed ATCM. The workgroup is comprised of over 60 representatives of affected industry and associations, air pollution control and air quality management districts' (district) staff, and other interested members of the public. The ARB staff held six public meetings with workgroup members between January and September 2003. In addition, the ARB staff held numerous individual meetings and conference calls with affected industry, associations, engine manufacturers, and environmental groups during the development of the proposed ATCM. Finally, the ARB staff held three public workshops in October, November, and December 2003 to solicit ideas and comments from the public on the proposed ATCM requirements.

An e-mail list server was created to notify potentially affected industry and other interested parties of the progress of the proposed ATCM. Approximately 500 individuals from government, environmental groups, industry, and associations subscribe to the list server. The ARB staff created and has maintained a website to facilitate the dissemination of up-to-date information on the progress of the proposed ATCM at *http://www.arb.ca.gov/diesel/ portdiesel.htm.*

The ARB staff attended several California Air Pollution Control Officers Association (CAPCOA) Engineering and Enforcement Managers Meetings to brief district staff on the developments of the proposed ATCM requirements and to solicit districts' input. The staff also held several conference calls with district staff during the development of the proposed ATCM to discuss the districts' specific concerns with the proposed requirements. In addition, ARB staff surveyed a cross-section of air districts to better understand the specific requirements placed on portable diesel engines by the districts. The ARB staff also surveyed city, county, and state facilities to solicit information on the types and numbers of portable engines used by government agencies.

E. SUMMARY OF THE PROPOSED ATCM

1. What does the proposed ATCM require?

The proposed ATCM would affect all diesel-fueled portable engines that are larger than 50 horsepower (hp). Included are engines that are registered under ARB's Portable Equipment Registration Program (PERP), engines that are permitted by the districts, and engines that have historically been exempt from district permits. The proposed ATCM would require all portable engines to be certified to Tier 1, 2, or 3 U.S. EPA /ARB off-road engine standards by 2010. After 2010, it would require all fleets of portable engines to meet diesel PM emission averages that become more stringent in 2013, 2017, and 2020. The owners/operators of these fleets will have flexibility in determining how the fleet emission standards are to be satisfied. Options that are available to satisfy this standard include: operating cleaner engines, replacing engines, using add-on control devices, switching to alternative fuels or alternative diesel fuels, and receiving credit for electrification.

By 2020, the proposed ATCM would require portable diesel-fueled engines to be certified to proposed Tier 4 emission standards for U.S. EPA/ARB newly manufactured off-road engines or be equipped with a Level-3 PM control technology or a combination of verified control technologies to achieve 85 percent reduction.

2. Are there exemptions to the proposed ATCM?

Engines that would be exempt from the proposed ATCM include: engines less than or equal to 50 hp; engines used to propel mobile equipment; portable equipment that is owned by the United States Department of Defense and used in combat, combat support, tactical or relief operations, or training for such operations (military tactical support equipment); and portable engines used at San Clemente or San Nicolas Island.

3. What is the requirement for 2010?

The proposed regulation requires all diesel-fueled portable engines in California to be certified engines by 2010, as is currently required for engines registered under PERP. This provision would expand the certified engine requirement in the PERP to engines permitted by districts and engines exempt from district permit requirements.

4. What are the fleet requirements?

After 2010, owners of fleets of portable engines must satisfy progressively more stringent diesel PM emission standards by 2013, 2017, and 2020. The purpose of the diesel PM emission standards is to create additional diesel PM emission reductions beyond those that would be achieved from normal engine turnover after 2010.

A fleet includes portable engines registered with PERP, portable engines permitted with local districts, and portable engines exempt from district permit requirements. The fleet shall exclude portable engines that operate exclusively outside of California, engines operated only within the Outer Continental Shelf (OCS), engines used exclusively in emergency applications, and engines qualifying as low-use (engines operating 80 hours or less per year). Portable engines can also be exempt from the fleet requirements if equipped, as of January 1, 2004, with a properly operating selective catalytic reduction (SCR) system. Existing engines with SCR systems are excluded due to the current technical challenge of installing both SCR and a diesel particulate filter (DPF) to one engine. After January 1, 2004, SCR-equipped engines will be considered on a case-by-case basis regarding installations of DPFs.

Standards are proposed for engines less than 175 horsepower, engines between 175 horsepower and 749 horsepower, and engines greater than or equal to 750 horsepower. The diesel PM standards (grams per brake horsepower-hour (g/bhp-hr)) are illustrated below:

Fleet Standard Compliance Date	Engines <175 hp (g/bhp-hr)	Engines ≥175 to 749 hp (g/bhp-hr)	Engines ≥ 750 hp (g/bhp-hr)
1/1/13	0.3	0.15	0.25
1/1/17	0.18	0.08	0.08
1/1/20	0.04	0.02	0.02

Owners of portable engine fleets will determine compliance with the proposed fleet standard by comparing the fleet's actual weighted diesel PM emission rate with the fleet emission standard.

To encourage the use of cleaner technologies and to encourage repowering or replacement of older engines with new, lower-emitting engines, the proposed ATCM provides several incentives to promote these options as part of the fleet reduction approach.

One incentive allows credit toward satisfying a fleet standard by adding alternative fueled engines to the fleet. To obtain the credit, the engine must operate at least 100 hours annually. The proposed ATCM also allows credit for applications where grid power is used in lieu of using a diesel fuel. The credit is granted where more than 200 hours of grid power is used for a given project and the necessary recordkeeping and reporting requirements are satisfied. Finally, a credit is included to encourage the purchase of proposed Tier 4 engines. (The Tier 4 engines are proposed to be available in the 2011 to 2014 timeframe.) The credit can be used when fleet owners purchase Tier 4 engines prior to January 1, 2015. In these cases, the owner can count the Tier 4 engine twice in the calculations for the fleet-weighted diesel PM emission rates for compliance with the 2013 and 2017 diesel PM standards.

5. <u>What are the fleet requirements in 2013 and 2017 for emergency use and low-use engines?</u>

Engines that are used exclusively in emergency applications or are deemed low-use engines are not subject to the fleet emission standards. Instead these engines would be required by January 1, 2020, to be certified to proposed Tier 4 engines standards, or be equipped with a Level-3 PM control technology, or a combination of verified control technologies to achieve a 85 percent diesel PM reduction.

6. <u>What are the requirements for school zones?</u>

The ARB staff is continuing to work with the California Air Pollution Control Officer's Association (CAPCOA) and other stakeholders to determine if it is feasible to develop provisions to address the operation of portable diesel-fueled engines near schools during periods when children are present.

7. What are the recordkeeping and reporting requirements?

For many fleets, the recordkeeping would only consist of keeping track of all the engines in the fleet and their associated emission factors. Specific recordkeeping requirements address only those engines in a fleet whose use is based on minimum or maximum hourly limitations, fleets taking advantage of the electrification incentive, and engines equipped with SCR.

All fleet owners will have to submit a status report to the ARB by March 1, 2011, that includes the fleet's average diesel PM emission rate for the 2010 calendar year, information identifying each engine in the fleet, and each engine's emission rate. In addition, fleet owners must submit signed statements of compliance and corroborating data indicating that they are meeting the fleet standards by March 1 of each applicable year (i.e., 2013, 2017, 2020).

8. What are the enforcement requirements?

Health and Safety Code 39666 (d) requires the districts to implement and enforce an ATCM that has been approved by the Board. Therefore, both the ARB and the districts have the authority to review or seek enforcement action for violation of the proposed regulation.

F. ENVIRONMENTAL AND ECONOMIC IMPACTS OF THE PROPOSED ATCM

1. How does the proposed ATCM relate to ARB's goals for Environmental Justice?

The proposed ATCM is consistent with the ARB's Environmental Justice policy to reduce health risks from TACs in all communities, including low-income and minority communities. Portable engines are used in both urban and rural communities. Because they are used for a number of activities throughout the State, the risk posed by these engines may potentially impact all communities in California. Limiting diesel PM emissions from diesel-fueled portable engines in California will provide air quality benefits to all communities, including minority and low-income communities in the State.

2. What are the environmental impacts of the proposed ATCM?

The proposed ATCM will reduce diesel PM emissions and associated exposures from portable engines throughout California. The table below provides ARB staff estimates of diesel PM emissions reductions from portable engines resulting from implementation of the proposed ATCM in addition to benefits from the PERP. The estimates are based upon reductions from the year 2000 base year. California's air quality will also experience benefits from reduced criteria pollutant emissions (e.g. NOx, ROG). The table also provides ARB staff estimates for

NOx and ROG reductions. By 2010, diesel PM emissions will be reduced by 2.2 TPD, or about 803 TPY, and NOx emissions will be reduced by 34 TPD, or about 12,400 TPY.

Year	Diesel PM Emissions (TPD)	Percent Reduction	NOx Emissions (TPD)	Percent Reduction	ROG Emissions (TPD)	Percent Reduction
2000	4.2	--	67	--	6.7	--
2010	2.0	52%	33	51%	4.6	30%
2015	1.3	69%	26	61%	2.9	57%
2020	0.2	95%	23	66%	1.2	78%

The ARB staff anticipates significant health cost savings due to reduced mortality, incidences of cancer, PM-related cardiovascular effects, chronic bronchitis, asthma, and hospital admissions from pneumonia and asthma-related conditions. The diesel PM reductions are expected to reduce the number of premature deaths in California. Although the implementation date for the final diesel PM emission standards in the proposed regulation is 2020, the ARB staff believes that the full benefits of the diesel PM standard requirements will extend to 2037. (The ARB staff assumes that through a normal engine turnover rate, all portable diesel-fueled engines would have been replaced by engines that are certified to the proposed Tier 4 standards by approximately 2037. Therefore, the costs and benefits of the proposed ATCM extend to 2037, despite the full implementation by 2020.) The ARB staff estimates that by 2037, 768 premature deaths will be avoided. Prior to 2037, cumulatively, it is estimated that 50 premature deaths would be avoided by 2010 and 339 by 2020. Additional health benefits are expected from the reduction of NOx emissions, which give rise to secondary PM from the conversion of NOx to $PM_{2.5}$ nitrate. The ARB staff has concluded that no significant adverse environmental impacts should occur from adoption of, and compliance with, the proposed ATCM.

3. <u>What are the economic impacts of the proposed ATCM?</u>

The ARB staff estimates the total cost of the proposed ATCM to affected businesses and government agencies to be between $350 and $420 million discounted back to year 2002 or between $2 and $34 million per year, averaging $15 million per year. The economic impact is distributed over a 30-year period to 2037.

The ARB staff estimates that the total cost, including capital and ongoing cost, to a typical small business (a fleet of five or less engines) to be between $30,000 and $38,000 discounted back to year 2002, or about $2,000 per year. The total cost to a typical business (a fleet of fifteen engines), including capital and ongoing cost is estimated to be between $226,000 and $238,000, discounted

back to year 2002, or about $8,200 per year. The cost for complying with the proposed ATCM is affected by the number of engines in the fleet, the age of the engine, and the horsepower size of the engines in the fleet.

The costs are attributable to early replacement of existing engines, the installation of diesel PM reduction technologies, and registration fees for engines previously not required to operate with a permit. The ARB staff assumed that an existing engine would eventually be replaced at the end of its useful life and took into account the remaining value of the existing engine at the time the proposed ATCM requires the engine to be replaced with a new, cleaner engine. For example, a typical rental fleet has a more frequent engine turnover rate—about five to seven years—than other types of businesses. Consequently, the proposed ATCM will not affect these types of businesses as much as other industries that tend to keep their engines for longer periods of time. The estimated annual ongoing costs to comply with the proposed ATCM include annual costs for recordkeeping of $300 - $600, and $300 per engine for annual maintenance of emission control devices (diesel particulate filters). In addition, staff estimates that the typical company will spend a total of $125 - $1,000 to prepare the status report for compliance with the 2010 requirement and the three compliance reports for the 2013, 2017, and 2020 fleet standards.

Overall, most affected businesses will be able to absorb the costs of the proposed regulation with no significant adverse impacts on their profitability. This finding is based upon staff's estimated change in "return on owner's equity" (ROE) analysis. The analysis found that the overall change in ROE ranges from negligible to a decline of about 7 percent. Because the proposed ATCM would not alter significantly the profitability of most businesses, we do not expect a noticeable change in employment, business creation, elimination, or expansion, and business competitiveness in California. We also found no significant adverse economic impacts on any local or State agencies.

The overall estimated cost effectiveness of the proposed ATCM, considering only the benefits of reducing diesel PM is between $16 and $19 per pound of diesel PM reduced. Since the proposed ATCM will also result in reductions of ROG and NOx emissions, ARB staff allocated half of the costs of compliance against these benefits, resulting in cost effectiveness values of $8-$10 per pound of diesel PM reduced and less than $2 per pound of ROG and NOx reduced.

The estimated cost of control per premature death prevented by the proposed ATCM is $ 275,000 in 2002 dollars. Using U.S. EPA's established value for avoiding a premature death, $2.44 million (using 2037 as the end year of analysis) at seven-percent discount rate, and $4.78 million at three percent, both values discounted back to year 2002, the cost range per death avoided because of this proposed regulation is 9 to 17 times lower than the U.S. EPA's benchmark for value of avoided death. This rule is, therefore, a cost-effective mechanism to

reduce premature deaths that would otherwise be caused by diesel PM emissions without this proposed regulation.

G. NEXT STEPS

After the proposed ATCM is approved by the Board, the staff will continue its outreach efforts by distributing information on the ATCM requirements—via ARB's portable-engine website and briefing papers—to the districts, trade associates and organizations, engine manufacturers, engine repair services, and control technology companies. The staff will also, with the districts, educate owners of portable engines that are permitted with the districts of the ATCM requirements. In addition, staff will educate owners of portable engines that are registered with PERP. The ARB staff will work with the districts on identifying portable engine owners that have not obtained permits or have registered with PERP. These unregulated engines will need to be identified and brought into the regulatory process so that all owners of portable engines in California are ultimately complying with the proposed ATCM requirements. Finally, staff will monitor the development of retrofit technologies and the availability of proposed Tier 4 engines, and will conduct an assessment of this ATCM in the 2008 timeframe.

H. RECOMMENDATION

The staff recommends the Board approve the proposed ATCM presented in this report (Appendix A). The ATCM will reduce diesel PM emissions from portable engines by requiring the use of only the cleanest new engines and the most stringent retrofit of existing portable engines. The proposed ATCM will provide air quality benefits for all communities depending upon the number and duration of portable use in those communities. The ARB staff believes that the proposed ATCM is technologically feasible and necessary to carry out the Board's responsibilities under State law.

I. INTRODUCTION

In this chapter, the Air Resources Board (ARB or Board) staff provides an overview of the Staff Report, discusses the purpose of the proposed air toxic control measure for diesel-fueled portable engines (proposed ATCM), the regulatory authority of the ARB to adopt the proposed ATCM, and the outreach efforts by ARB staff while developing the proposed ATCM requirements.

A. Overview

This report presents the proposed ATCM to reduce the emissions of diesel particulate matter (diesel PM) from diesel-fueled portable engines. A detailed summary of the requirements of the proposed ATCM is found in Chapter V. The report also shares the information that ARB staff used in developing the proposed ATCM. This information includes:

- the health effects associated with exposure to diesel PM emissions (Chapter II)
- the requirements of current regulations that are designed to reduce emissions from diesel-fueled portable engines (Chapter III)
- the diesel PM emission inventory and the risk posed by diesel-fueled portable engines (Chapter IV)
- the regulatory alternatives to the proposed ATCM and why they were not chosen (chapter VI)
- the environmental impacts of implementing the proposed ATCM (Chapter VII)
- the economic impacts of the proposed ATCM (Chapter VIII)

The text of the proposed ATCM and other supporting information are found in the Appendices.

B. Purpose

The primary purpose of the proposed ATCM is to reduce the general public's exposure to diesel PM from diesel-fueled portable engines. Chapter V of this Staff Report contains a plain English discussion of the key requirements of the proposed ATCM, and Appendix A contains the full text of the proposed ATCM.

C. Regulatory Authority

Several sections of the California Health and Safety Code (HSC) provide the ARB with authority to adopt the proposed ATCM. HSC sections 39600 (General Powers) and 39601 (Standards, Definitions, Rules, and Measures) confer to the ARB the general authority and obligation to adopt rules and measures necessary to execute the Board's powers and duties imposed by State law.

More specifically, California's Air Toxics Program, established under California law by Assembly Bill (AB) 1807 (Stats. 1983, Ch. 1047), and set forth in Health and Safety Code sections 39650 through 39675, mandates the identification and control of air toxics in California. The identification phase of the Air Toxics Program requires the ARB, with participation of other state agencies, such as the Office of Environmental Health Hazard Assessment (OEHHA), to evaluate the health impacts of and exposure to substances and to identify those substances that pose the greatest health threat as toxic air contaminants (TACs). The ARB's evaluation is made available to the public and is formally reviewed by the Scientific Review Panel (SRP), established under Health and Safety Code section 39670. Following the ARB's evaluation and the SRP's review, the Board may formally identify a TAC at a public hearing. Following the identification of a substance as a TAC, Health and Safety Code sections 39658 and 39665 require the ARB, with the participation of the air pollution control and air quality management districts, and in consultation with affected sources and interested parties, to prepare a report on the need and appropriate degree of regulation for that substance (risk management phase).

In August 1998, the Board identified diesel PM as a TAC, and in September 2000, the ARB adopted the "Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-fueled Engines and Vehicles" (Diesel Risk Reduction Plan). The Diesel Risk Reduction Plan was the first formal product of the risk management phase and serves as the needs assessment under the AB 1807 process. In the Diesel Risk Reduction Plan, the ARB identified the available options to reduce diesel PM and the recommended control measures to achieve reductions, including a measure to reduce diesel PM from diesel-fueled portable engines.

In 1999, California's Air Toxics Program was amended by Senate Bill 25 (Stats. 1999, Ch. 731) to provide additional requirements for further consideration of health impacts to infants and children. As part of these requirements, OEHHA was to identify up to five TACs as making children especially susceptible to illness. OEHHA published the "Prioritization of Toxic Air Contaminants under the Children's Environmental Health Protection Act" in October 2001, identifying diesel PM as one of the five TACs. Additional requirements established by Senate Bill 25 in Health and Safety Code section 39669.5 directs the ARB to adopt control measures, as appropriate, to protect public health, particularly infants and children, from these specially identified TACs.

This ATCM is being proposed to fulfill the goals of the Diesel Risk Reduction Plan and to comply with the requirements of H&S Code section 39666 and 39669.5 to prevent an endangerment to public health.

D. Public Outreach

An open public process is an essential part of the adoption of any air quality regulation, including this proposed ATCM. The ARB staff made extensive efforts to ensure that the public was aware of, and had an opportunity to participate in, the rulemaking process for this proposed control measure.

Outreach Efforts

In 2002, ARB staff formed a Portable Diesel Engine workgroup to assist with the development of the proposed ATCM. The workgroup is comprised of over 60 representatives of affected industry and associations, staff from the air pollution control and air quality management districts (districts), and other interested members of the public. All businesses with engines registered with ARB's Portable Equipment Registration Program (PERP) were notified of the formation of the workgroup to solicit their participation in the development of the proposed ATCM. These businesses would be directly impacted by the proposed ATCM. The PERP is discussed in Chapter III. The ARB staff held six public meetings with workgroup members between January and September 2003, with the option to participate via conference call to further meet the convenience of others. The ARB staff also held three public workshops in October, November, and December of 2003 to solicit ideas and comments from the general public on the proposed ATCM requirements. A summary of staff's outreach meetings is included in Table I-A below.

Table I-1: Public Workgroup and Workshop Meetings

Portable Diesel-Fueled Engines ATCM Public Workshops	October 3, 2003 (Sacramento)
	November 18, 2003 (Sacramento)
	December 4, 2003 (El Monte)
Portable Diesel-Fueled Engines ATCM Workgroup Meetings	January 31, 2003
	March 6, 2003
	May 9, 2003
	June 5, 2003
	July 30, 2003
	September 12, 2003

The ARB staff created an e-mail list server to notify potentially affected industries and other interested parties of the workgroup meetings and the public workshop, and to provide list server subscribers the opportunity to review draft versions of the regulation. Approximately 500 individuals from government, environmental groups, industries, and associations subscribe to the list server.

In addition to the public meetings, ARB staff held several individual meetings and conference calls with affected industry, associations, engine manufacturers, and environmental groups during the development of the proposed ATCM to address their specific concerns regarding the proposed requirements.

Furthermore, as a way of generating public participation and to enhance the information flow between ARB and interested persons, ARB staff has created and maintained a website to facilitate the dissemination of up-to-date information on the development of this proposed diesel PM control measure. The website is located at http://www.arb.ca.gov/diesel/portdiesel.htm.

The ARB staff attended several California Air Pollution Control Officers Association (CAPCOA) Engineering and Enforcement Manager Meetings to brief district staff on the developments of the control measure requirements and to solicit districts' input. The staff also held several conference calls with district staff during the development of the proposed ATCM to discuss the districts' specific concerns with the proposed requirements. Furthermore, ARB staff surveyed a cross-section of air districts through telephone calls and e-mails to better understand the specific requirements placed on portable diesel-fueled engines by the districts.

The staff also sent over 1,000 surveys to California cities, counties, colleges, and state-owned facilities in 2002 to inform these agencies of the development of the proposed ATCM and to solicit information on the types and numbers of portable engines that are used in state and local government. A summary of the survey results along with a copy of the survey that was sent to the agencies is included in Appendix B.

II. NEED FOR REDUCTION OF DIESEL PARTICULATE MATTER EMISSIONS

The primary goal of the Diesel Risk Reduction Plan is to reduce diesel PM emissions and the associated cancer risk by 85 percent in 2020. This proposed ATCM to reduce diesel PM emissions from diesel-fueled portable engines is one of a large group of regulations being developed to achieve the Plan's emission- and risk-reduction goals. The proposed ATCM will also reduce emissions of reactive organic gases (ROG) and oxides of nitrogen (NOx), precursors to the formation of ozone.

This chapter describes the physical and chemical characteristics of diesel PM, the health effects of the pollutants emitted by diesel engines, and the environmental benefits from implementing the proposed regulation. As discussed below, it is important that steps be taken to reduce emissions from all diesel-fueled engines, including diesel-fueled portable engines, to reduce public exposures to diesel PM and ozone; to further assist the State with meeting the ambient air quality standards; and to improve visibility.

A. Physical and Chemical Characteristics of Diesel PM

Diesel engines emit a complex mixture of inorganic and organic compounds that exist in gaseous, liquid, and solid phases. The composition of this mixture will vary depending on engine type, operating conditions, fuel, lubricating oil, and whether or not an emission control system is present. The primary gas or vapor phase components include typical combustion gases and vapors such as carbon monoxide (CO), carbon dioxide (CO_2), sulfur dioxide (SO_2), NOx, ROG, water vapor, and excess air (nitrogen and oxygen).

The emissions from diesel-fueled engines also contain potential cancer-causing substances such as arsenic, nickel, benzene, formaldehyde, and polycyclic aromatic hydrocarbons (PAHs). There are over 40 substances that are listed by the United States Environmental Protection Agency (U.S. EPA) as hazardous air pollutants and by the ARB as toxic air contaminants (TACs) in emissions from diesel-fueled engines. Fifteen of these substances are listed by the International Agency for Research as carcinogenic to humans, or as a probable or possible human carcinogen. The list includes the following substances: formaldehyde, acetaldehyde, 1,3-butadiene, antimony compounds, arsenic, benzene, beryllium compounds, inorganic lead, mercury compounds, bis(2-ethylhexyl)phthalate, dioxins and dibenzofurans, nickel, Polycyclic Organic Matter (including PAHs); and styrene.

Diesel PM is either directly emitted from diesel-powered engines (primary particulate matter) or is formed from the gaseous compounds emitted by a diesel engine (secondary particulate matter). Diesel PM consists of both solid and

liquid material and can be divided into three primary constituents: the elemental carbon fraction, the soluble organic fraction, and the sulfate fraction.

Many of the diesel particles exist in the atmosphere as a carbon core with a coating of organic carbon compounds, or as sulfuric acid and ash, sulfuric acid aerosols, or sulfate particles associated with organic carbon. The organic fraction of the diesel particle contains compounds such as aldehydes, alkanes and alkenes, and high-molecular weight PAH and PAH-derivatives. Many of these PAHs and PAH-derivatives, especially nitro-PAHs, have been found to be potent mutagens and carcinogens. Nitro-PAH compounds can also be formed during transport through the atmosphere by reactions of adsorbed PAH with nitric acid and by gas-phase radical-initiated reactions in the presence of oxides of nitrogen. Fine particles may also be formed secondarily from gaseous precursors such as SO_2, NOx, or organic compounds. Fine particles can remain in the atmosphere for days or weeks and travel through the atmosphere for hundreds or thousands of kilometers, while coarse particles deposit to the earth within minutes or hours and within tens of kilometers from the emission source.

Almost all of the diesel particle mass is in the fine particle range of 10 microns or less in diameter (PM_{10}). Approximately 94 percent of the mass of these particles is less than 2.5 microns in diameter. Diesel PM can be distinguished from noncombustion sources of $PM_{2.5}$ by the high content of elemental carbon with the adsorbed organic compounds and the high number of ultrafine particles (organic carbon and sulfate).

The soluble organic fraction (SOF) consists of unburned organic compounds in the small fraction of the fuel and atomized and evaporated lube oil that escape oxidation. These compounds condense into liquid droplets or are adsorbed onto the surfaces of the elemental carbon particles. Several components of the SOF have been identified as individual toxic air contaminants.

B. Health Impacts of Exposure to Diesel PM, Ambient Particulate Matter, and Ozone

The proposed ATCM will reduce the public's exposure to diesel PM, as well as reduce ambient particulate matter. In addition, the proposed ATCM is expected to result in reductions in emissions of NOx and ROG, which are precursors to the formation of ozone in the lower atmosphere. The primary health impacts of these air pollutants are discussed below.

Diesel Particulate Matter

Diesel PM is of specific concern because it poses a lung cancer hazard for humans as well as a hazard from noncancer respiratory effects such as pulmonary inflammation. Because of their small size, the particles are readily respirable and can effectively reach the lowest airways of the lung along with the

adsorbed compounds, many of which are known or suspected mutagens and carcinogens. More than 30 human epidemiological studies have investigated the potential carcinogenicity of diesel PM. On average, these studies found that long-term occupational exposures to diesel exhaust were associated with a 40 percent increase in the relative risk of lung cancer (OEHHA, 1998). However, there is limited specific information that addresses the variable susceptibilities to the carcinogenicity of diesel exhaust within the general human population and vulnerable subgroups, such as infants and children and people with preexisting health conditions. Also, the genotoxicity of diesel exhaust and some of its chemical constituents have been reported in a number of studies.

Diesel PM was listed as a toxic air contaminant (TAC) by ARB in 1998 after an extensive review and evaluation of the scientific literature by OEHHA (CARB, 1998). Using the cancer unit risk factor developed by OEHHA for the TAC program and modeled ambient concentrations of diesel PM, it was estimated that for the year 2000, exposure to ambient concentrations of diesel PM (1.8 $\mu g/m^3$) represented a health risk of 540 potential cancer cases per million people exposed over a 70-year lifetime.

Another significant health effect of diesel exhaust exposure is its apparent ability to act as an adjuvant in allergic responses and possibly asthma (Diaz-Sanchez et al. 1996, Takano et al. 1998, Diaz-Sanchez et al. 1999). However, additional research is needed at diesel exhaust concentrations that more closely approximate current ambient levels before the role of diesel PM exposure in the increasing allergy and asthma rates is established.

Ambient Particulate Matter

Numerous epidemiological studies have shown that an increase in the ambient PM concentration can, in fact, cause adverse health effects. The key health effects associated with ambient particulate matter, of which diesel PM is a component, are premature mortality; aggravation of respiratory and cardiovascular disease (as indicated by increased hospital admissions and emergency room visits, school absences, work loss days, and restricted activity days); aggravated asthma; acute respiratory symptoms, including aggravated coughing and difficult or painful breathing; chronic bronchitis; and decreased lung function that can be experienced as shortness of breath (U.S. EPA 2000b, U.S. EPA 2003a).

The health impacts from exposure to the fine particulate matter ($PM_{2.5}$) component of diesel exhaust have been calculated for California, using concentration-response equations from several epidemiological studies. Both mortality and morbidity effects are associated with exposure to both direct diesel $PM_{2.5}$ and indirect $PM_{2.5}$, the latter of which arises from the conversion of diesel NO_x emissions to $PM_{2.5}$ nitrates. It was estimated that 2000 and 900 premature deaths resulted from long-term exposure to both 1.8 $\mu g/m^3$ of direct $PM_{2.5}$ and

0.81 $\mu g/m^3$ of indirect $PM_{2.5}$, respectively, for the year 2000. The mortality estimates are likely to exclude cancer cases, but may include some premature deaths due to cancer, because the epidemiological studies did not identify the cause of death. Exposure to fine particulate matter, including diesel $PM_{2.5}$, can also be linked to a number of heart and lung diseases.

Ozone

Diesel exhaust consists of hundreds of gas-phase, particle-phase, and semi-volatile organic compounds, including typical combustion products, such as CO_2, hydrogen, oxygen, and water vapor, as well as CO, VOCs, carbonyls, alkenes, aromatic hydrocarbons, PAHs, PAH derivatives, and SOx—compounds resulting from incomplete combustion. Ozone is formed by the reaction of ROG and NOx in the atmosphere in the presence of heat and sunlight. The highest levels of ozone are produced when both ROG and NOx emissions are present in significant quantities on clear summer days. This pollutant is a powerful oxidant that can damage the respiratory tract, causing inflammation and irritation, which can result in breathing difficulties.

Studies have shown that there are impacts on public health and welfare from ozone at moderate levels that do not exceed the national 1-hour ozone standard. Short-term exposure to high ambient ozone concentrations has been linked to increased hospital admissions and emergency visits for respiratory problems (U.S. EPA, 2000b). Repeated exposure to ozone can make people more susceptible to respiratory infection and lung inflammation and can aggravate preexisting respiratory diseases, such as asthma. Prolonged (6 to 8 hours), repeated exposure to ozone can cause inflammation of the lung, impairment of lung defense mechanisms, and possibly irreversible changes in lung structure, which over time could lead to premature aging of the lungs and/or chronic respiratory illnesses such as emphysema and chronic bronchitis.

The subgroups most susceptible to ozone health effects include individuals exercising outdoors and children and people with preexisting lung disease such as asthma, and chronic pulmonary lung disease. Children are more at risk from ozone exposure because they typically are active outside during the summer when ozone levels are highest. Also, children are more at risk than adults from ozone exposure because their respiratory systems are still developing. Adults who are outdoors and moderately active during the summer months, such as construction workers and other outdoor workers, are also among those most at risk. These individuals, as well as people with respiratory illnesses such as asthma, especially asthmatic children, can experience reduced lung function and increased respiratory symptoms, such as chest pain and cough, when exposed to relatively low ozone levels during prolonged periods of moderate exertion.

C. Health and Environmental Benefits from Implementation of the Proposed Regulation

Reducing diesel PM emissions from diesel-fueled portable engines will have both public health and environmental benefits. The proposed ATCM will reduce localized potential cancer risks associated with diesel-fueled portable engines that are near receptors and will contribute to the reduction of the general exposure to diesel PM that occurs on a region-wide basis due to collective emissions from diesel-fueled engines. Additional benefits associated with the proposed regulation include further progress in meeting the ambient air quality standards for PM_{10}, $PM_{2.5}$, ozone, and visibility.

Reduced Diesel PM Emissions

The estimated reductions in diesel PM emissions and the associated health benefits from reduced exposures and risk are discussed in detail in Chapter VII.

Reduced Ambient Particulate Matter Levels

Reducing diesel PM will help efforts to achieve the ambient air quality standards for particulate matter. Both the State of California and the U.S. EPA have established standards for the amount of PM_{10} in the ambient air. These standards define the maximum amount of PM that can be present in outdoor air. California's PM_{10} standards were first established in 1982 and updated June 20, 2002. The current PM_{10} standard is more protective of human health than the corresponding national standard. Additional California and federal standards were established for $PM_{2.5}$ to further protect public health (Table II-1).

Table II-1: State and National PM Standards

California Standard		National Standard	
PM_{10}			
Annual Arithmetic Mean	20 $\mu g/m^3$	Annual Arithmetic Mean	50 $\mu g/m^3$
24-Hour Average	50 $\mu g/m^3$	24-Hour Average	150 $\mu g/m^3$
$PM_{2.5}$			
Annual Arithmetic Mean	12 $\mu g/m^3$	Annual Arithmetic Mean	15 $\mu g/m^3$
24-Hour Average	No separate State standard	24-Hour Average	65 $\mu g/m^3$

Particulate matter levels in most areas of California exceed one or more of current state PM standards. The majority of California is designated as non-attainment for the state PM_{10} standard (CARB, 2002a). Diesel PM emission reductions from diesel-fueled engines will help protect public health and assist in

furthering progress in meeting the ambient air quality standards for both PM_{10} and $PM_{2.5}$.

The emission reductions obtained from the implementation of this proposed ATCM will result in lower ambient particulate matter levels and significant reductions of exposure to primary and secondary diesel PM. Lower ambient particulate matter levels and reduced exposure mean reduction of the prevalence of the diseases attributed to diesel PM, reduced incidences of hospitalizations, and prevention of premature deaths.

Reduced Ambient Ozone Levels

Emissions of the ozone precursors NOx and ROG will also be reduced by the proposed regulation. In California, most major urban areas and many rural areas continue to be non-attainment for the State and federal 1-hour ambient air quality standard for ozone. Controlling emissions of ozone precursors would reduce the prevalence of respiratory problems associated with ozone exposure and would reduce hospital admissions and emergency visits for respiratory problems. Ozone can also have adverse health impacts at concentrations that do not exceed the 1-hour National Ambient Air Quality Standards (NAAQS).

Table II-2: State and National Ozone Standards

California Standard		National Standard
1 hour	0.09ppm (180 $\mu g/m^3$)	0.12ppm (235 $\mu g/m^3$)
8 hour	_	0.08 ppm (157 $\mu g/m^3$)

Improved Visibility

In addition to the public health effects of fine particulate pollution, fine particulates including sulfates, nitrates, organics, soot, and soil dust contribute to the regional haze that impairs visibility.

In 1999, the U.S. EPA promulgated a regional haze regulation that calls for states to establish goals and emission reduction strategies for improving visibility in 156 mandatory Class I national parks and wilderness areas. California has 29 of these national parks and wilderness areas, including Yosemite, Redwood, and Joshua Tree National Parks. Reducing diesel PM from diesel-fueled portable engines will help improve visibility in these Class I areas.

III. DIESEL-FUELED PORTABLE ENGINE USE AND EXISTING REGULATIONS

This chapter describes the types of businesses that use portable engines and associated equipment and describes existing regulations that currently impact portable engines used in California.

A. Summary of Portable Engine Use and Activities

Portable engines are internal combustion engines that are designed and capable of being carried or moved from one location to another. Unlike stationary engines, portable engines may be moved to various locations on the same facility, to other facilities within the same district, or throughout the State. The engines are used to power a variety of equipment, including: pumps (e.g., agricultural irrigation pumps and other water pumps), ground support equipment at airports, cranes, oil-well drilling and workover rigs, power generators, dredging equipment, rock crushing and screening equipment, welding equipment, woodchippers, and compressors.

Both private businesses and public agencies operate portable engines and associated equipment in California. Examples of businesses that use portable engines in their activities include motion picture studios, amusement parks, agriculture, air couriers, airlines, utilities, construction services, crushing, screening, and recycling services, industrial cleaning services, marine construction and dredging services, oil and gas well service companies, refineries, and rental services. Examples of public agencies that use portable engines include public schools and universities, local governments, county landfills, municipal utilities, wastewater treatment facilities, prisons, military installations, the California Department of Transportation, and other state agencies.

Portable engines and associated equipment can be categorized according to business type. A description of the businesses and public agencies and the type of equipment that is used in each category are provided below.

Rental

The businesses that are under the rental category specialize in the rental of power generation for construction activities, maintenance and repair at industrial sites, and emergency standby power. The portable equipment used by these companies includes generators, compressors, and pumps.

Oil and Gas Well Service

Businesses in this category specialize in drilling and maintaining oil and gas wells. Portable equipment used by these companies includes drilling and workover rigs, compressors, pumps, and generators.

Construction

Businesses in this category build roads, bridges, and structures, and are also involved in the demolition of such structures. Portable equipment used by these companies includes compressors, generators, booster pumps, cranes, rock crushers, rock drills, pile drivers, and welders.

Government

The government category includes governmental agencies, such as the California Department of Transportation, municipal governments, wastewater treatment plants, and water districts. Air compressors, auxiliary engines for street sweepers, brush chippers, drill rigs, emergency power generators, hydraulic pumps, power shovels, road maintenance equipment, and water pumps are some types of portable equipment that may be used by these agencies.

Industrial

This category includes businesses specializing in water-well drilling and pumping services, and industrial cleaning services. Portable equipment used by these companies includes compressors, sand blasters, drill rigs, pumps, and emergency standby engines.

Electric Utilities

The electric utility category is made up of companies that provide natural gas and electricity. The portable equipment used by utilities includes compressors, wood chippers, and emergency standby equipment.

Telecommunication

Telecommunication companies primarily use generators to provide emergency power at cell towers.

Wood Waste Recycling

Businesses in this category trim and remove trees and recycle tree parts. The portable equipment used by these companies includes wood chippers and tub grinders.

Entertainment

Businesses in this category primarily use generators to produce power for lighting, air conditioning, and other essential services at locations outside of the movie studios.

Marine Construction and Dredging

Businesses in this category maintain waterways and harbors using barges equipped with generators, large pumps, or cranes.

Ground Support

Businesses in this category use portable equipment to support the operation of airports and aircraft. The equipment used includes air compressors, start carts, and air-conditioning units.

Aggregate

Businesses in this category specialize in the crushing and sizing of gravel. Generators, rock crushers and screeners are the primary portable equipment used by these businesses.

Military

The military category includes military bases and military facilities that utilize portable equipment. Generators and compressors are the primary portable equipment used by the military.

Agriculture

Agriculture operations consist of the growing of crops or the raising of fowl or animals. Irrigation pumps are the primary portable equipment used by these businesses.

The above listing demonstrates the many diverse uses of portable diesel-fueled engines. There is significant variation in the size of the engines and the way these engines are used. The size of engines can range from about 50 hp to 3,000 hp. Due to the mobile nature of portable engines, the emissions typically would not occur in one location, but would be spread out over many locations over the course of a year. In addition, the actual operation of a specific engine can vary significantly from the average. For example, engines used only for emergency applications may operate less than 20 hours per year. Conversely, some portable activities can operate more than 2,000 hours per year. The average annual operating hours for portable diesel-fueled engines is about 450 hours per year. Finally, the engine's load varies depending upon the application.

Similar to the variability in the hours of operation, an engine's load can very significantly from application to application, from 25 percent to 80 percent of maximum load. The average load is typically 50 percent of maximum load.

In summary, the engines affected by this proposed ATCM represent a broad array of diverse applications. As discussed throughout this report, the diversity in the sizes and uses of portable diesel-fueled engines makes it a challenge to develop an effective and enforceable regulatory proposal.

B. Existing Regulations

This section describes the federal preemption that limits the ARB's and local districts' authority to regulate portable engines. It also describes specific federal, state, and local programs that currently impact portable engines used in California. These programs include the ARB/U.S. EPA emission standards for newly manufactured off-road engines, the ARB's Statewide Portable Equipment Registration Program, and the local air pollution control and air quality management district (district) permitting programs. All of these programs play a role in the ARB's and districts' efforts to attain the State and federal ambient air quality standards, particularly the ozone standards. Consequently, the focus of the programs has been to reduce emissions of NOx and ROG, and to a lesser extent reduce emissions of carbon monoxide (CO) and PM.

Federal Preemption

The Clean Air Act Amendments of 1990 generally preempted states from adopting emission standards for new nonroad engines or vehicles. Under section 209(e) of the Clean Air Act, all states are precluded from adopting emissions standards and other requirements for new nonroad engines smaller than 175 hp and used in construction or agricultural equipment or vehicles. As for other new nonroad engines, California, in recognition of the longstanding mobile source program already in place and the challenging air quality problems it faces, was allowed to adopt and enforce emission standards after receiving an authorization to do so from the U.S. EPA. California refers to engines called nonroad by the U.S. EPA as offroad engines. Accordingly this report will use the California terminology to describe such engines hereafter.

ARB/U.S. EPA New Engine Emission Standards

As mentioned above, the Clean Air Act Amendments provided for an authorization for California to adopt and enforce emissions standards for offroad engines (other than engines under 175 hp and used in construction or agricultural equipment or vehicles). Since January 1, 1996, new portable engines sold in California have been subject to ARB's Off-Road Compression Ignition emission standards (Title 13, California Code of Regulations, sections 2420 - 2427), which are equivalent to the U.S. EPA emission standards for newly

manufactured nonroad engines (40 Code of Federal Regulations, Part 89). These engines will be referred to as "certified engines" throughout the remainder of this report. The standards are tiered (i.e., Tier 1, 2, 3), with each set of standards phased in over several years based on the power rating of the engine. The Tier 1, 2, and 3 engine standards are presented in Appendix C. In 2006, newly manufactured portable engines of all sizes will be subject to Tier 2 standards, and in 2008, newly manufactured engines of all sizes will be subject to Tier 3 standards. Table III-1 illustrates the emission standards that will be in place for portable engines greater than 50 horsepower when Tier 3 standards are fully phased in.

Table III-1: Emission Standards (g/bhp-hr) That Will Be In Effect When Off-Road Standards (Tier 3) Are Fully Implemented

Rated Power (hp)	PM	CO	When Standards Apply	NMHC + NOx	When Standards Apply
Greater than or equal to 50 but less than 100	0.30	3.7	2004	3.5	2008
Greater than or equal to 100 but less than 175	0.22	3.7	currently	3.0	2007
Greater than or equal to 175 but less than 750	0.15	2.6	currently	3.0	2006
Greater than 750	0.15	2.6	2006	4.8	2006

Tier 4 emission standards were proposed by U.S. EPA in April 2003, and will, if adopted, require most engines to meet more stringent PM and NOx limits. These standards would be phased in during the 2011-2014 timeframe. As soon as the U.S. EPA Tier 4 standards are adopted, the ARB plans to adopt new engine standards that harmonize with the new federal standards. The proposed Tier 4 emission standards are presented in Table III-2 below:

Table III-2: Proposed U.S. EPA Tier 4 Emission Standards (g/hp-hr) for Engines Greater than 50 hp

Rated Power	First year that Standards Apply	PM	NOx
Greater than or equal to 25 but less than 75	2008 2013	0.22[1] 0.02	3.5[2] 0.3
Greater than or equal to 75 but less than 175	2012-2014	0.01	0.30
Greater than or equal to 175 but less than 750	2011-2013	0.01	0.30
Greater than 750	2011-2014	0.01	0.30

[1] The manufacturer has the option of skipping the 2008 standards for all 50-75 hp engines; the 0.02 g/bhp-hr PM standard would then take effect one year earlier for these engines (2012).

[2] The 3.5 g/hp-hr standard includes both NOx and nonmethane hydrocarbons.

These proposed Tier 4 standards would achieve diesel PM reductions of over 90 percent when compared to uncertified engine emission levels (i.e., engines not meeting an ARB/ U.S. EPA off-road engine emission standard). Similarly, replacing an uncertified engine with a proposed Tier 4 engine would result in reductions of NOx of over 90 percent.

Statewide Portable Equipment Registration Program

All of California's 35 air districts operate permit programs. In most cases, portable engines are subject to permit requirements established by the local air districts. Many portable engines—especially rental engines, dredging equipment, and oil-well drilling and servicing rigs—operate in multiple districts. Instead of obtaining multiple permits from individual districts, a portable engine owner can register the engine with ARB's Statewide Portable Equipment Registration Program (PERP), which was established in 1997 (Title 13, California Code of Regulations, sections 2450-2466; Health and Safety Code Section 41750-41755). Portable-engine owners have registered over 14,500 engines under PERP, which represents nearly half of the estimated statewide inventory of portable engines. Most of the engines in PERP are diesel-fueled.

The PERP regulations were designed to promote the use of clean portable engines in California. By January 1, 2010, all engines registered under PERP must be certified to ARB/U.S. EPA off-road engine emission standards (Tier 1, 2, or 3). Consequently, engines currently in the program that do not meet at least Tier 1 standards (generally those manufactured before 1996) must be replaced with certified engines—Tier 2 or Tier 3, depending on the year the engine is

purchased—by that date. By 2010, full implementation of the PERP requirements will result in reductions of diesel PM emissions from portable engines currently registered in the State by an estimated 30 percent or about 250 tons per year (0.7 tons per day) of diesel PM. The proposed portable diesel-fueled engine ATCM expands the PERP to achieve additional diesel PM reductions. For example, one of the short-term goals of the proposed ATCM is to ensure that all portable engines in California, whether registered with PERP or governed by district rules, are certified engines by 2010, the same requirement engines registered with the PERP program must satisfy.

Local District Permit Programs

Portable engines are generally subject to local air district permitting requirements, although some districts specifically exempt them. Owners of portable engines and associated equipment, where exempt, are not required to obtain construction or operating permits. Nor do they have to register their equipment with PERP, as PERP registration is a voluntary program in lieu of acquiring local air district permits.

The ARB staff estimates that there are approximately 3,000 portable engines in California that are permitted by the districts. District permit requirements vary, depending on the severity of the air quality in the district. The districts regulate pollutants and their precursors for which there are ambient air quality standards (NOx, PM, VOCs) as well as specific toxic air contaminants (e.g., benzene, hexavalent chromium, and lead).

In addition to the portable diesel engines currently permitted by the local air districts, ARB staff estimates that there are several thousand engines subject to permitting requirements that are neither permitted nor registered in PERP. By definition, portable engines may move continually from location to location, which can make them difficult to identify as nonpermitted. The local air districts and the ARB need to enhance outreach opportunities to engine owners, informing them of their permitting requirements. Additionally, there are portable engines that are currently exempt from local air district permitting requirement—due to size or application—that will be subject to the proposed ATCM and will therefore need to apply for permits or State registration.

Local air district permits for portable engines may contain a variety of operating requirements and restrictions. The ARB staff reviewed district rules and surveyed a cross-section of air districts to better understand the specific requirements placed on portable engines by the districts. A summary of district rules that apply to portable engines is included in Appendix D. One of the most common requirements for new engines is the installation of Best Available Control Technology (BACT). BACT is typically expressed as an emission level (e.g., grams per brake-horsepower hour), and the requirement is typically satisfied by the applicant either selecting existing equipment or a technology that satisfies the

emission level or by installing add-on air pollution control equipment. For portable diesel engines, however, the federal Clean Air Act amendments preempt the districts from requiring add-on control equipment on new engines, so many districts require new portable engines to meet ARB/U.S. EPA newly manufactured off-road engine standards at the time a permit to construct is issued.

Several districts also have source-specific regulations. For example, Ventura County Air Pollution Control District regulates oilfield drilling operations by requiring, if certain criteria are met, the use of electrified drilling equipment. Several other districts require portable engines to satisfy the applicable requirements of their internal combustion engine rules.

Currently, eight districts have adopted Toxics New Source Review rules and many more districts have adopted policies regulating the potential toxic emissions from a new project. These rules and policies require the application of toxics BACT and require denial of the project if the project has the potential to exceed specified thresholds for risk. Risk is typically evaluated based upon the potential increases in cases of cancer. Based upon risk, some districts also limit the hours of operation of a portable engine. The hours are limited so that the risk posed by the engine does not exceed the potential risk level where a permit is typically denied, usually at levels greater than 10 in a million potential cancer cases.

Five districts—Antelope Valley, Northern Sierra, San Diego, San Joaquin Valley Unified, and Yolo-Solano— have implemented registration programs specifically for portable engines and associated equipment. Owners of portable engines in these districts can register their engines with the district instead of obtaining an individual permit by demonstrating their engines meet specific emission rates.

IV. EMISSIONS, EXPOSURE, AND POTENTIAL RISK FROM DIESEL-FUELED PORTABLE ENGINES

This chapter presents the most recent emissions inventory for diesel-fueled portable engines in California as well as a discussion on the potential cancer health risks that may occur due to the operation of diesel-fueled portable engines.

A. Estimated Emissions

In January 2000, the Board approved an emission inventory for large off-road compression ignition engines using the Off-Road Emissions Model (Off-Road Model), which establishes emission estimates for engines 25 horsepower and larger used in off-road applications. The model was used to estimate the 2000, 2010, and 2020 portable engine inventory and associated diesel PM emissions presented in the Diesel Risk Reduction Plan.

The ARB staff used the Off-Road Model to estimate the number of portable engines greater than 50 horsepower in California and the associated diesel PM emissions. The staff updated the inventory for diesel-fueled agricultural irrigation pumps by using more recent engine estimates from agriculture representatives and the local air districts.

Based on this inventory, staff estimates that there are 33,000 portable engines in California with an estimated 4.2 tons per day or 1,500 tons per year of diesel PM emissions. Estimates for current statewide diesel PM, NOx, and ROG emissions from all diesel-fueled portable engines are included in Table IV-1.

Projected 2010 and 2020 Emission Estimates for Diesel-Fueled Portable Engines

The projected emission estimates for 2010 and 2020 are also included in Table IV-1. These estimates include benefits from the PERP, new engine standards, and turnover in the engine population, but do not include the projected additional reductions expected from implementation of the proposed ATCM. Expected emission reductions from the implementation of the proposed ATCM are discussed in Chapter V. As shown in Table IV-1, ARB staff predicts significant decreases in diesel PM, NOx, and ROG emissions from diesel-fueled portable engines between 2000 and 2020 due largely to PERP and engine turnover.

Table IV-1: Emission Estimates of Diesel-Fueled Portable Engines (without ATCM Implementation), Tons per Day

Emissions, Tons per Day			
Year	Diesel PM	NOx	ROG
2000	4.2	67.1	6.7
2010	2.8	45.3	4.6
2020	1.8	34.1	3.1

B. Potential Exposure and Risk

This section examines the potential exposures and cancer health risks associated with diesel PM emissions from diesel-fueled portable engines.

Diesel-fueled portable engines are used in a variety of applications. The majority of applications using portable diesel-fueled engines are completed in a short period of time. Examples of short-duration projects include the chipping of tree trimmings or maintenance of sewage drains and utility electrical equipment. These types of activities may use one or two portable diesel-fueled engines for a few hours over one or two days. Conversely, a major maintenance activity to update or replace existing infrastructure, such as electrical power lines or the construction of a large office complex, can utilize several portable engines for six months to several years. Because of the variability in the use of portable diesel-fueled equipment and the mobile nature of portable equipment, it is difficult to quantify the potential health risk resulting from the operation of a portable diesel-fueled engine on any specific receptor

The current risk assessment methodology recommended by the Office of Environmental Health Hazard Assessment (OEHHA) and used by ARB staff in evaluating potential cancer risk is based upon exposure to the emissions of a source for 70 years. We recognize that if this methodology is used to evaluate portable applications, the resulting potential cancer risk is overly conservative in that portable applications are short-term activities that are not likely to operate at the same location year-after-year for 70 years.

However, qualitative conclusions can be drawn regarding potential exposures to the emissions from diesel-fueled portable engines. Many Californians are impacted by diesel PM emissions from the operation of over 33,000 portable diesel-fueled engines in the State. The emissions from these engines contribute toward the ambient concentration of diesel PM. For the year 2000, exposure to ambient concentrations of diesel PM (1.8 $\mu g/m^3$) represented a health risk of 540 potential cancer cases per million people exposed over a 70-year lifetime. Based upon the emissions inventory for diesel PM, portable diesel-fueled engines

account for five percent of the ambient concentration. In addition, many of the engines are used in urban locations where the probability of a person living close to an engine is high.

The overall excess cancer risk can be significantly reduced by replacing older portable diesel-fueled engines with new cleaner diesel-fueled engines. For example, if an older engine is replaced with a Tier 3 engine, the diesel PM emissions and associated risk would be reduced by 55 to 70 percent. Reductions of over 95 percent can be achieved if the older engine is replaced with a Tier 4 engine, which is proposed to be available in the 2011-2014 timeframe.

V. SUMMARY OF PROPOSED CONTROL MEASURE FOR PORTABLE ENGINES

In this chapter, the ARB staff provides a discussion in plain English of the key requirements of the proposed air toxic control measure (ATCM) for diesel-fueled portable engines. After a general overview of the ATCM, the remainder of the chapter is structured in accordance with the structure of the ATCM. This chapter is intended to satisfy the requirements of Government Code section 11343.2, which requires that a "plain English" summary of the regulation be made available to the public.

A. Summary of Requirements

The proposed ATCM would affect all diesel-fueled portable engines that are larger than 50 horsepower (hp). This includes engines that are registered under the Portable Equipment Registration Program (PERP), engines that are subject to district permits, and engines that have been exempt to date from district permitting requirements. The proposed ATCM would reduce emissions of diesel PM by first requiring all portable engines to be certified to Tier 1, 2, or 3 U.S. EPA /ARB off-road engine standards by 2010, as is currently required for engines registered under PERP. After 2010, it would require all fleets of portable engines to meet diesel PM emission averages that become more stringent in 2013, 2017, and 2020. Owners/operators of these fleets will have flexibility in determining how the fleet emission standards are to be satisfied. Options that are available to satisfy this standard include: operating cleaner engines, replacing engines, using add-on control devices, switching to alternative diesel fuels or alternative fuels, and receiving credit for electrification.

To meet the proposed diesel PM standard for 2020, all engines in a fleet would either: a) be certified to the proposed Tier 4 newly manufactured off-road engine emission standards; or b) be equipped with a Level-3 PM control technology; or c) be a certified engine equipped with a combination of verified control technologies which achieve an emission of 0.04 g/bhp-hr for engines that are less than 175 horsepower or 0.02 g/bhp-hr for engines that are 175 horsepower and larger. As discussed previously, proposed Tier 4 off-road engine standards refer to emission standards expected to be finalized by the U.S. EPA in 2004 that would require the use of efficient PM reduction technologies, such as particulate filters, to be an integral part of the manufactured engine. Level-3 PM control technology refers to a control technology that has been verified to achieve PM reductions of at least 85 percent under ARB's *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emission from Diesel Engines* [1] (Verification Program). The ARB Verification Program for diesel PM control technologies is explained in more detail in Appendix E.

[1] Approved by the Board in May 2002. Title 13, California code of Regulations, sections 2700-2710.

1. Applicability of the Proposed ATCM

The proposed ATCM would affect diesel-fueled portable engines greater than 50 hp. For the engine to be portable, the engine must not reside at any one location for more than 12 consecutive months. A location is any place of operation or single site at a building, structure, facility, installation, or well site. An engine that remains at one location for more than 12 consecutive months would be considered a stationary engine.

Staff is proposing not to include smaller engines at this time because these engines represent a small fraction of total emissions from portable engines in California. Furthermore, since these engines are currently exempt from district permit requirements—making identification, location, and compilation of operating data for these engines difficult and resource-intensive—a separate rulemaking effort may be necessary at a later date. While the proposed ATCM would not regulate these smaller portable engines, both the ARB and U.S. EPA have promulgated emission standards for new engines manufactured after 1995 for engines less than 25 hp and standards for engines manufactured after 1999 for engines 25 to 50 hp. Therefore, as natural attrition occurs—newer engines replacing older ones—the emissions from this category of smaller portable engines will diminish over time.

The proposed ATCM would also affect portable agricultural irrigation pumps that were previously exempt from regulations under Health and Safety Code section 42310. Senate Bill 700 which was chapter on September 22, 2003, and becomes effective on January 1, 2004, removes the exemption for equipment used in the raising of fowl or animals or the growing of crops. Consequently, agricultural irrigation pumps, whether in stationary location or used as portable equipment, that were previously exempt from district permits will now fall under district jurisdiction.

2. Exemptions to the Proposed ATCM

There are certain types of diesel-fueled engines that would be exempt from the proposed ATCM. The exemptions are as follows:

Engines Used In Mobile Applications

Engines used to propel mobile equipment and motor vehicles would not be regulated by this proposed ATCM. The ARB expects to regulate these engines through mobile-source regulations being developed for public and private on-road and off-road fleets. These engines include dual-use engines that both propel the equipment and operate the attached equipment. Examples of a dual-use engines would include cranes and cherry pickers. Power Take-Off (PTO) applications would also not be subject to the proposed ATCM. PTO refers to a

piece of equipment attached to a motor vehicle that is powered by the same engine that is used to propel the vehicle. An example would be a welder on a utility truck that is powered by the truck's engine.

Dual-Fuel Diesel Pilot Engines

Duel-fuel diesel pilot engines using an alternative fuel or an alternative diesel fuel would not be subject to this proposed ATCM. These engines use a small amount of diesel fuel, typically less than 5% of the total fuel used by the engine, and therefore the emissions of diesel PM would be a small portion of the engine's total emissions.

Military TSE

Military tactical support equipment (TSE) would not be regulated by this proposed ATCM. TSE refers to portable equipment that is owned by the United States Department of Defense and its allies and used in combat, combat support, tactical or relief operations, or training for such operations. Section 41754 of the Health and Safety Code specifically exempts TSE from control technology requirements and in-use operational controls. Portable diesel-fueled engines that are not considered TSE at military installations in California would be subject to this proposed ATCM.

Ground Support Equipment

Ground support equipment (GSE) refers to mobile and portable equipment used to support the operation of an airport. Portable equipment typically represents a small fraction (10 - 15 percent) of the total ground support equipment at an airport. This equipment includes ground power units, air conditioners, and start-carts.

To address emissions from GSE in the South Coast Air Quality Management District (SCAQMD), the ARB, the air district, and the major air carriers at the five major airports within the SCAQMD recently signed a Memorandum of Understanding (MOU), which requires the air carriers to reduce the emissions of diesel PM and ozone precursors from their GSE fleets over a specific timetable. In recognition of the commitments made under the MOU, ARB staff is proposing a mechanism that, upon a finding that equivalent or greater overall PM reductions is achieved under the MOU, would exempt the portable diesel-fueled equipment subject to this MOU from the proposed ATCM. Should similar MOUs be executed at other major airports across the State, the portable equipment portion of the affected GSE could also qualify for exemption from this proposed ATCM.

Other Categories

Portable engines that use an alternative fuel—such as natural gas, propane, butane, and gasoline— are not subject to the proposed ATCM as it only applies to portable engines that are fueled with diesel. Portable engines used at San Clemente or San Nicolas Island are also not subject to the requirements of the proposed ATCM. This exemption is consistent with the SCAQMD and Ventura County Air Pollution Control District internal combustion engine regulations, which exempt engines on these islands from the requirements of the regulation.

3. Fuel Requirements for Diesel-Fueled Portable Engines

The proposed ATCM requires portable engines to use ARB diesel fuel. The regulations for ARB diesel fuel were recently revised to limit the sulfur content of diesel fuel to 15 parts per million (ppm)[2]. The revised ARB diesel fuel regulations, which require the widespread availability of low-sulfur diesel fuel by mid-summer 2006, will help promote the use of the most efficient diesel PM control devices: diesel particulate filters.

The revised fuel regulations also allow mixtures of up to 50 percent biodiesel or 100 percent Fischer-Tropsch fuels to qualify as CARB diesel fuel as long as specific requirements are satisfied. While the use of biodiesel or Fischer-Tropsch fuels have been shown to reduce diesel PM, neither these fuels themselves or mixtures of these types of fuels have been verified under ARB's Verification Program for PM control technologies. The proposed ATCM allows only technologies or techniques, such as alternative diesel fuels or fuel additives, whose emission reductions have been verified by the ARB to be used for diesel PM reductions.

The requirements for verification differ depending on whether the diesel PM reduction strategy is considered an alternative diesel fuel or a control technology. A fuel additive can be treated in the verification process as an alternative diesel fuel or as a specific additive, which would be considered a control technology. If the additive is supplied to the engine fuel by an on-board dosing mechanism, is directly mixed into the fuel, or is added to the fuel at the time of refueling, then the additive is considered a control technology, not an alternative diesel fuel.

4. Requirements for 2010

The proposed regulation requires all portable diesel-fueled engines greater than 50 hp in California to be certified engines (engines certified to ARB/U.S. EPA newly manufactured off-road engine emission standards) by 2010, as is currently required for engines registered with the PERP. The 2010 requirement would

[2] Approved by the Board in July 2003. Revisions to section 2281, Title 13, California Code of Regulations.

expand the certified engine requirement in the PERP to engines permitted by districts and engines previously exempt from district permit requirements.

After 2006, the proposed ATCM requires all portable diesel-fueled engines greater than 50 hp initially registering or applying for permits from the local air districts to be certified engines. By 2010, all portable diesel-fueled engines greater than 50 hp—registered, permitted, or neither—must be certified engines (that is, the engine is certified to either a Tier 1,2 or 3 off-road emission standard) to operate legally in California. About 20,000 engines would need to be replaced, including about 6,000 registered with the PERP.

Recognizing that some portable engines are operated on a limited basis annually, an exception to the 2010 requirement is included in the proposed ATCM for engines used strictly for emergency purposes and low-use engines (engines operated 80 hours or less in a calendar year, including time for maintenance and testing). These engines are exempt from the 2010 requirements if a fleet owner commits to replacing the engines with engines certified to the proposed Tier 4 standards within two years from when Tier 4 engines become available. If the fleet owner does not commit to early replacement of these engines with Tier 4 engines, then the engines must be certified engines by 2010.

By requiring engine replacement by 2010, the proposed ATCM uses technology available either today or in the next few years to reduce diesel PM in the short-term. Verified add-on technologies are not yet available for off-road diesel engines, and the availability of Tier 4 engines will not occur until after 2011, if the U.S. EPA's 2003 proposal is approved in 2004. Setting an engine replacement schedule that would take effect significantly sooner than 2010 would be less effective in the long run, as many of the cleaner Tier 3 engines will not yet be commercially available. These engines will be available in the 2006-2008 timeframe. Staff believes that requiring the engines to be replaced by 2010 allows sufficient time for the engine manufacturers to satisfy the demand caused by the ATCM's proposed 2010 requirement.

5. Requirements for 2013, 2017, and 2020

After 2010, owners of fleets of portable engines must satisfy progressively more stringent diesel PM emission standards by 2013, 2017, and 2020. The purpose of the diesel PM emission standards is to create additional diesel PM emission reductions beyond those that would be achieved from normal engine turnover after 2010.

Definition of Fleet

A fleet includes portable engines registered with PERP, those permitted with local districts, and those that have been previously exempt from district permit

requirements. The fleet shall exclude portable engines that operate exclusively outside of California, engines operated only within the Outer Continental Shelf (OCS), engines used exclusively in emergency applications, and engines qualifying as low-use. Portable engines can also be exempt from the fleet requirements if equipped, as of January 1, 2004, with a properly operating selective catalytic reduction (SCR) system.

A fleet is defined in the proposed ATCM as an engine or group of engines either under the same ownership or owned by entities under the control of a Responsible Official. The Responsible Official refers to an individual who has the authority to certify that portable engines under his/her jurisdiction comply with the applicable requirements of the proposed ATCM, has authority to manage the use of the portable equipment, and may be involved in the purchase of the equipment.

A company or public agency can have more than one fleet if each fleet is under the control of different Responsible Officials. For example, companies owned by the same holding company could be considered to have separate fleets if each fleet's operation and composition are controlled by separate Responsible Officials. In the case of military installations, each installation is considered a separate fleet instead of one fleet under the control of the Department of Defense. Conversely, if several companies were under the common control of one Responsible Official, then all the portable engines in each of the companies would be considered one fleet.

As discussed later in this chapter, companies and public agencies are required to submit status reports to the Executive Officer prior to the implementation of the fleet emission standards. Based upon the information submitted, ARB staff will work with the Responsible Official to resolve any issues in determining the composition of each fleet prior to the first fleet emission standard becoming effective.

Fleet Diesel PM Standards

The ARB staff is proposing diesel PM standards for three ranges of engine sizes: engines less than 175 horsepower, engines between 175 horsepower and 749 horsepower, and engines greater than or equal to 750 horsepower. The diesel PM standards (grams per brake horsepower-hour (g/bhp-hr)) are illustrated below:

Fleet Standard Compliance Date	Engines <175 hp (g/bhp-hr)	Engines ≥175 to 749 hp (g/bhp-hr)	Engines ≥ 750 hp (g/bhp-hr)
1/1/13	0.3	0.15	0.25
1/1/17	0.18	0.08	0.08
1/1/20	0.04	0.02	0.02

Three sets of diesel PM standards are proposed to address the difference between off-road engine emission standards for engines less than 175 hp and emission standards for larger off-road engines. Emission standards for certified off-road engines less than 175 hp are less stringent than the standards for the larger class of engines; thus, the proposed diesel PM standards are less than for engines greater or equal to 175 hp. In addition, a third set of fleet standards is being proposed for engines greater than or equal to 750 hp. Staff is proposing this set of standards because these large engines are expensive to replace and have a much longer useful life than smaller engines. Owners of these larger engines are given more time for engine replacement; therefore, their 2013 standard is less stringent than the standard for 175-749 hp engines.

The proposed fleet emission standards take into account the potential commercial availability of Tier 4 engines, which should become available in the 2011 - 2014 timeframe. They also take into account the availability of verified Level-3 PM control technologies. The proposed 2013 standards are intended to force replacement of Tier 1 engines <750 hp with either Tier 3 or proposed Tier 4 engines. The PM standard for Tier 3 and Tier 4 off-road engines are significantly lower than the Tier 1 engine PM standard. At this time, most Tier 1 engines being replaced would have operated 10 to 17 years. Owners who had replaced uncertified engines with Tier 2 or Tier 3 engines prior to 2010 would probably not be subject to additional requirements until 2017.

The proposed 2017 standards are likely to result in half of the engines in a fleet being replaced with engines certified to the proposed Tier 4 standard or equipped with Level-3 control technology or a combination of verified control technologies to achieve 85% reduction. At this time, the affected engines would have operated 6 to 17 years. The proposed 2020 standards are likely to result in all engines in the fleet being certified to the proposed Tier 4 standard or equipped with Level-3 verified technology or a combination of verified control technologies to achieve 85% reduction.

Weighted Fleet Average

Owners of portable engine fleets will determine compliance with the proposed fleet standard by comparing the fleet's actual weighted diesel PM emission rate with the fleet emission standard. The fleet's actual weighted emission rate shall be determined by using the following formula:

$$\frac{\sum \text{Summation for each engine in the fleet (bhp x emission factor)}}{\sum \text{Summation for each engine in the fleet (bhp)}}$$

Where: bhp = horsepower at maximum rated capacity
Emission factor = diesel PM emission rate

For example: A fleet owner has five certified engines with the following horsepower and PM emission factors:

75 hp	emission rate of 0.30 g/bhp-hr
75 hp	emission rate of 0.30 g/bhp-hr
100 hp	emission rate of 0.22 g/bhp-hr
150 hp	emission rate of 0.22 g/bhp-hr
150 hp	emission rate of 0.22 g/bhp-hr

$$\frac{(75 \times 0.30) + (75 \times 0.30) + (100 \times 0.22) + (150 \times 0.22) + (150 \times 0.22)}{75 + 75 + 100 + 150 + 150}$$

Fleet's weighted diesel PM emission rate = 0.24 g/bhp-hr

Emission factors can be used that are derived from results of emission tests used to certify the engine to U.S. EPA /ARB off-road engine standards. This information can be accessed from the U.S. EPA's Engine Certification Information Center (www.epa.gov/otaq/certdata.htm) or from the ARB's California Certification Data Website (www.arb.ca.gov/msprog/mvcert/mvcert.htm). These emission factors can be modified using the emissions reductions for the control technologies that have been verified through the ARB Verification Procedure. For example, if an engine owner installs a diesel particulate filter that has been verified to an 85 percent control effectiveness, the engine's emission factor would be the certified value multiplied by 0.15.

Emergency and Low-Use Engines

As discussed above, engines that are used exclusively in emergency applications or are deemed low-use engines are not subject to the fleet emission standards of the proposed ATCM. These engines would be required, by January 1, 2020, to: 1) be certified to the proposed Tier 4 newly manufactured off-road engine emission standards, or 2) be equipped with a Level-3 PM control technology, or 3) be a certified engine equipped with a combination of verified control technologies to achieve an emission of 0.04 g/bhp-hr for engines < 175 hp or 0.02 g/bhp-hr for engines that are ≥175 hp. Compliance for these engines was delayed until January 1, 2020, because these engines emit less than one percent of the total diesel PM emissions from portable engines and requiring these engines to meet the interim fleet averages would not be cost-effective.

Engines Equipped with SCR

As was mentioned earlier, portable engines may be exempt from the fleet requirements if equipped, as of January 1, 2004, with a properly operating SCR system. This provision was included for a number of reasons. Source test results have shown that an SCR system, typically used to reduce NOx, also significantly reduces diesel PM emissions. In addition, the pressure drop requirements for engines makes it technically challenging today to add additional control technologies, such as a diesel particulate filter, to an engine already equipped with SCR. The proposed ATCM provisions also allow engines equipped with SCR systems after the January 1, 2004, date to be exempted from fleets on a case-by-case basis. To qualify for the exemption, engine owners must submit specific information to the Executive Officer indicating that the SCR system is operating properly.

Owners of portable engines equipped with SCR may chose to include these engines in the fleet weighted diesel PM standard. Engine-specific source tests from these engines must be used to determine diesel PM emission rates. PM measurements can be performed using ARB Test Method 5 front-half (filter and probe wash) or equivalent district methods. Requiring only the front-half of ARB Test Method 5 is consistent with the recommendations of the Test Method Working Group that was created during the development of the Stationary Compression Ignition Engines ATCM and consistent with test methods used to certify engines to off-road engine standards. The Test Method Working Group was formed to evaluating different test methods for measuring PM from diesel-fueled engines and to recommend the most appropriate measuring technique for diesel PM.

6. Incentives

To encourage the use of cleaner technologies and to encourage repowering or replacement of older engines with new, lower-emitting engines, the proposed ATCM provides for several incentives to promote these options as part of the fleet reduction approach.

One incentive allows credit toward satisfying a fleet standard by allowing, under certain circumstances, alternative-fueled engines into the fleet. To obtain the credit, the engine must operate at least 100 hours annually. The proposed ATCM also allows credit for applications where grid power is used in lieu of using a portable diesel-fueled engine. The credit is granted where more than 200 hours of grid power is used for a given project and the necessary recordkeeping and reporting requirements are satisfied. Finally, a credit is included to encourage the purchase of engines certified to the proposed Tier 4 standard. The credit can be used when fleet owners purchase Tier 4 engines prior to January 1, 2015. In these cases, the owner can count the Tier 4 engine twice in the calculations for the fleet weighted diesel PM emission rates. To use the

credit for the 2013 standard, the engine must be in the fleet prior to January 1, 2013. Double counting the Tier 4 engines will result in lower fleet weighted diesel PM rates for compliance with the 2013 and 2017 diesel PM standards. The double counting of Tier 4 engines is not allowed for compliance with the diesel PM standards for 2020 because all engines must be certified to the proposed Tier 4 standards or retrofitted with verified control devices to achieve 85 percent reduction by that date.

7. Requirements Near Schools

The ARB staff is continuing to work with the California Air Pollution Control Officer's Association (CAPCOA) and other stakeholders to determine if it is feasible to develop provisions to restrict the operation of portable diesel-fueled engines near schools during periods when children are present. At the February Board meeting, staff will present a proposal to limit the emissions of diesel PM near schools.

8. Recordkeeping and Reporting Requirements

As discussed below, the proposed ATCM specifies recordkeeping and reporting requirements to enhance the enforceability of the proposed ATCM. These recordkeeping and reporting requirements may be in addition to requirements that are specified in applicable registration or permit requirements for a portable engine.

In developing the proposed ATCM, staff intended that the recordkeeping and reporting requirements be the minimum necessary to ensure that the proposed regulation is enforceable. To this end, recordkeeping and reporting requirements are not specified in the proposed ATCM for determining a company's or agency's compliance with the 2010 requirement. Staff believes that compliance with the 2010 requirement can be enforced through the existing PERP and district permit programs.

Recordkeeping

For many fleets, the recordkeeping would only consist of keeping track of all the engines in the fleet and their associated emission factors. If the fleet's diesel PM emission rate average satisfies the 2020 fleet standards, then all the engines in the fleet are not subject to the recordkeeping or reporting requirements of the proposed ATCM. To satisfy the 2020 fleet standards, all the portable diesel-fueled engines in the fleet must either be certified to the proposed Tier 4 off-road engine emission standards or be equipped with a Level-3 PM control technology or a combination of verified control technologies that achieve 85 percent reduction.

The recordkeeping requirements address only those engines in a fleet whose use is based on minimum or maximum hourly limitations, fleets taking advantage of the electrification incentive, engines equipped with SCR, and engines operating near schools. Engines with hourly limitations would include alternative-fueled portable engines that are run for at least 100 hours per year, engines operating 80 hours or less per year (low-use engines), and engines used exclusively in emergency applications where yearly use would be limited. These engines must be equipped with a non-resettable hour meter and the operator must maintain records on the engines' annual hours of operation. The proposed ATCM requires the company to maintain the records at a central place for five years. In addition, a company is required to forward copies of records within three business days, if requested by either the ARB or local district staff.

Recordkeeping requirements are also required if electrification is used to satisfy a fleet requirement and for all engines equipped with SCR. If electrification is used to determine the fleet average, the ARB must be notified in advance of projects that will rely on electrification instead of using diesel engines. The notification shall identify each engine that will be affected by the electrification project and shall include information on the electrification activity. For engines equipped with SCR, records must be maintained to demonstrate that the SCR system is operating properly. The records must be retained for five years. In addition, a company is required to forward copies of these records within three business days, if requested by either the ARB or local district staff.

Status Report

The proposed ATCM requires the responsible official of the fleet to submit a status report by March 1, 2011, and subsequent compliance statements by March 1 of each applicable year when a fleet emission standard becomes effective.

The purpose of the status report is to provide the ARB and local air districts specific information on the composition of the fleet. The 2011 status report will include the fleet's average diesel PM emission rate for the 2010 calendar year, as well as a summary of each engine's emission rate, in g/bhp-hr. The status report should indicate the number of fleet(s) in each company or agency and the Responsible Official in charge of each fleet. The status report must identify whether each engine in each fleet within a company or agency is registered with ARB's PERP program or permitted with local districts. Alternative fueled engines must be identified by fuel type. Sufficient information should be provided for each engine to be able to identify the engine, including the make, model, serial number, year of manufacture, and district permit or state registration number. Additionally, the status report must identify each engine that the owner commits to replacing with an engine certified to the proposed Tier 4 standards, engines used exclusively in emergency applications, engines satisfying the low-use

engine requirements, and must include documentation for engines equipped with SCR demonstrating that the SCR system is operating properly.

Compliance Statements

The Responsible Official of the company must provide a signed statement of compliance indicating the applicable fleet emission standard is being achieved and identifying each engine in the fleet and the associated emission rate. The statement of compliance is due March 1 of the year the fleet emission standard becomes effective (i.e. 2013, 2017, 2020). Compliance is based upon the composition of the fleet as of January 1 of that year. Sufficient information should be provided for each engine in the fleet to be able to identify the engine, including the make, model, serial number and year of manufacture. The compliance report shall identify engines used exclusively in emergency application, low-use engines and engines excluded from the fleet because the engine operated exclusively outside of California or operated only within the OCS. If electrification was used for the calculating the fleet average, documentation must be included in the report supporting the credit claimed for electrification. As part of the compliance report, the responsible official shall certify the following:

- All alternative-fueled engines included in the fleet average operated at least 100 hours in the previous calendar year;
- engines designated as emergency were only used for emergency applications;
- engines designated as low-use were operated no more than 50 hours in the previous calendar year; and
- engines equipped with SCR comply with applicable district or PERP requirements.

The proposed ATCM allows the ARB and the district staff to require additional information from a fleet owner, beyond the submittal of compliance reports, that demonstrates the fleets are in compliance with the applicable fleet standards. The fleet owner must provide the information requested within 30 days.

9. Enforcement Requirements

Health and Safety Code 39666 (d) requires the districts to implement and enforce an ATCM that has been approved by the Board. Therefore, both the ARB and the districts have the authority to review or seek enforcement action for violation of the fleet emission standards. Despite this overlapping jurisdiction, it is not the intent of the ATCM to place engine owners in "double jeopardy." Appropriate enforcement action will be taken by either the ARB or the local air districts, as necessary.

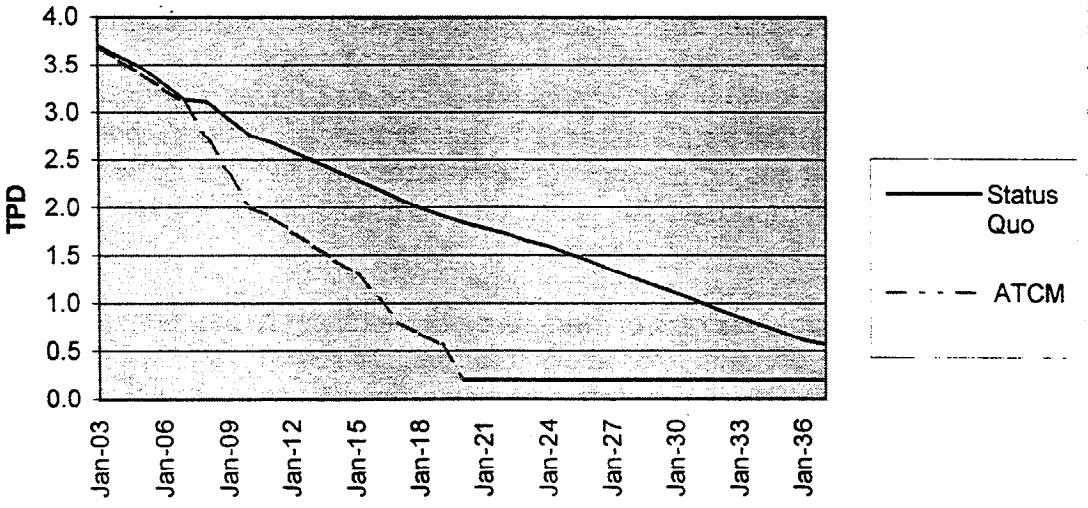
B. Evaluation of Proposed ATCM

The purpose of the proposed ATCM is to achieve the goal of the Diesel Risk Reduction Plan, which is an 85 percent reduction in diesel PM by 2020. The ARB staff estimates that the proposed ATCM will go beyond that goal by reducing diesel PM emissions by approximately 95 percent, as compared to the 2000 base year.

The proposed ATCM reduces diesel PM emissions in two ways: requiring older, dirtier engines to be replaced by newer, cleaner engines before the end of the useful life of the older engines, and requiring the installation of add-on control technologies. Without the proposed ATCM, emissions reductions would occur as seen in the "status quo" line in Figure V-1, below. The "status quo" reductions are achieved through PERP (to 2010), then a routine replacement of engines over a period of time (i.e., natural attrition). The expedited emissions reductions of the proposed ATCM are also illustrated in Figure V-1; the benefits of the ATCM are quantified by the area between the two curves.

The reductions peak by 2020, at 1.6 tons per day or 584 tons per year, when the proposed ATCM is fully implemented and then decreases until 2037. Overall, the proposed ATCM will result in cumulative diesel PM reductions of 4,700 tons by 2020 and 10,800 tons by 2037. At this time, the emissions from the status quo case are nearly equivalent to the emissions generated by the proposed ATCM. This is not unexpected, as natural attrition would have eventually (by ~2040) resulted in a replacement of all existing engines with engines certified to the proposed Tier 4 standard.

Figure V-1: Projected Diesel PM Emissions for Status Quo and the Implementation of the Proposed ATCM



The reductions resulting from the PERP program are an important portion of the reductions that occur prior to January 1, 2010. As discussed previously, by January 1, 2010, engines registered with PERP must be certified to an emission standard for off-road engines. The PERP program has about 30 percent of the portable diesel-fueled engines operating in California, and by January 1, 2010, the program is expected to reduce diesel PM emissions by 250 tons per year or about 0.7 tons per day. The current PERP reductions are significant in that it represents about 75 percent of the reduction for the status quo case by 2010 and about 30 percent of the reductions from the 2000 base year.

C. Complying with Federal Preemption For New Farm and Construction Off-Road Engines

As discussed in Chapter III, the Clean Air Act preempts all states from adopting emissions standards for new offroad engines smaller than 175 hp and used in farm and construction equipment and vehicles. The U.S. EPA has determined by regulation that such preemption applies to engines used "primarily" (51%) in farm and construction equipment. The proposed ATCM has been designed to conform with this preemption.

The proposed ATCM does not impose emission standards. The ATCM is largely predicated on the standards imposed by U.S EPA for newly manufactured off-road engines. The proposed ATCM can be satisfied by replacing older engines with newer, cleaner engines. These engines would not need to be modified, such as adding air pollution control equipment to reduce emissions. The proposed ATCM reduces diesel PM emissions by requiring all engines, by January 1, 2010, to be certified to U.S. EPA emission standards for newly manufactured off-road engines. Fleet owners would satisfy this requirement by replacing older engines with new engines manufactured to meet off-road emission standards. Subsequent diesel PM reductions are achieved with the use of fleet emission standards. For the fleet emission standard that becomes effective January 1, 2013, staff expects fleet owners to replace Tier 1 engines, the oldest engines in the fleet, with the cleanest engine available. Similarly, to satisfy the proposed 2017 and 2020 fleet emission standards, fleet owners will need to replace about half of the engines not yet certified to the proposed Tier 4 standard in 2017 with proposed Tier 4 engines and replace the remaining engines in 2020.

The proposed ATCM also allows owners of portable-diesel fueled engines to comply by retrofitting portable engines with air pollution control systems that reduce diesel PM. As discussed previously, these control systems will need to be verified through the ARB Verification program. For example, to meet the 2017 fleet standard, owners of these engines would either replace the engine with a engine certified to the proposed Tier 4 standards or consider adding verified

control technologies. At this time, these Tier 2/3 engines will be seven to sixteen years old.

D. Technical Feasibility of The Proposed ATCM

The proposed ATCM requires all diesel-fueled portable engines to be certified engines (Tier 1, 2, or 3) by 2010. It also requires a fleet to meet progressively more stringent fleet weighted diesel PM standards by 2013, 2017, and 2020. The standards rely on the availability of cleaner off-road engines and verified Level-3 PM control technologies. Currently no Level-3 PM control technology has been approved by ARB for off-road applications nor have U.S. EPA Tier 4 off-road engine standards been approved.

Since the commercial availability of verified Level-3 PM control technologies and Tier 4 engines is uncertain, staff developed the proposed ATCM to obtain the initial diesel PM reductions by relying on proven technologies: replacing older, higher-emitting engines with newer engines that emit considerably less diesel PM. Although PM standards for off-road diesel engines become fully effective for all sizes of engines by January 1, 2006, greater NOx benefits can be realized if the proposed ATCM takes advantage of Tier 3 engines, which are fully implemented by January 1, 2008. To take advantage of this NOx benefit, and because of the time necessary to replace nearly 20,000 engines, the ARB staff is proposing that the initial requirements of the regulation take effect January 1, 2010. This schedule also harmonizes with the current PERP requirements.

Retrofit technologies can be used to satisfy the fleet standards in 2013, 2017, and 2020. Consequently, emission-control technology manufacturers will have many years to develop the desired retrofit technologies. In addition, prior to 2010, the ARB staff plans to review the status of verified retrofit technologies and other applicable activities that affect portable diesel-fueled engines, and to propose changes, as necessary, for the Board's approval.

While there are several technologies available to reduce diesel PM emissions, only one of these technologies have been verified for use on off-road engines. The proposed ATCM requires all control technologies to be verified through the ARB verification program. The available technologies include particulate filters, diesel oxidation catalysts (DOCs), fuel additives, and alternative diesel fuels. A brief description of these technologies and ARB's Verification Program for these technologies is given in Appendix E. ARB verification is based on whether a control technology can be applied to off-road or on-road diesel engines and on the level of PM control that can be achieved by the technology. Presently, only DOCs have been verified for off-road application. The DOC was verified to a Level-1, which means the technology achieves up to a 25 percent reduction in diesel PM.

Many of these technologies discussed above have been used primarily on on-road engines. DOC and passive particulate filters have been verified for on-road application. The other technologies listed, such as alternative diesel fuels, have been tested primarily on on-road fleets. Of these technologies, the one with the most promise to help ARB achieve the 85% reduction in 2020 is the diesel particulate filter. For example, several passive diesel particulate filters (DPFs) have been verified as Level-3 technologies—achieving at least 85% reduction of diesel PM—for on-road engines. The passive DPF is an attractive retrofit technology. The emission reductions are high, and since it regenerates itself during use, it is a relatively hands-off type of technology. Unfortunately, the currently verified passive DPFs are only applicable to cleaner engines that maintain exhaust temperatures sufficient for regeneration (greater than 225-300 degrees Celsius, depending on the DPF manufacturer).

To gain a better understanding of the applicability of particulate filters on portable engines a stack-temperature-profile test was conducted during 2002-2003. The University of California at Riverside's Center for Environmental Research and Technology (CE-CERT) conducted the test in coordination with ARB staff. Eighty engines and associated equipment ranging from 77 hp to 2150 hp were tested. The equipment included generators, compressors, wood chippers, pumps, and grinders that are used by a variety of industries. A temperature sensor was inserted into the exhaust stream of each engine and the temperature was recorded for 20 hours of engine use. The test data illustrated a wide variation of results. The ability of an engine to sustain the minimum temperature required for a DPF to function effectively depends on the engine's duty cycle. That is, if the engine idles for most of it's operating time, runs primarily at partial load, or generally runs constantly at full load when operated. A DPF will not operate well if there is significant idle time or the engine is run primarily at a low partial load—characteristics that describe the operating pattern of many portable engines. Consequently, the test results demonstrate DPF would not be effective for many portable engines. A detailed discussion of the stack-temperature-profile test and results is included in Appendix F.

In contrast to on-road applications, developing control techniques for portable equipment is likely to prove more challenging due to: 1) the large number of different applications for portable engines; 2) the number of different engine manufacturers and models; and 3) the varying duty cycles of each application. Consequently, for the reasons stated above, staff has not relied on the availability of retrofits to assist in complying with the ATCM provision in 2010. As discussed above, the proposed regulation has been crafted to rely on early engine replacement and has allowed a longer timeframe for the development of retrofit technologies for off-road applications. For example, many control technologies will be required for on-road engines by 2007, and some of these technologies may be adapted to portable equipment at a later date.

In summary, the proposed ATCM relies initially on existing off-road engine standards to generate the initial diesel PM reductions. To achieve the goal of 85% reduction by 2020, the proposed ATCM anticipates the development of Level-3 verified technologies for the off-road category and the availability of Tier 4 off-road engines beginning in 2013. Affected owners of portable diesel-fueled engines have expressed concern regarding the availability of Level-3 verified technologies for the off-road category as well as the widespread availability of Tier 4 off-road engines within the 2011-2014 timeframe. The ARB staff believes that the proposed ATCM has provided for sufficient time for the development of the Level-3 verified technologies. Staff will monitor the development of these technologies, and if necessary, propose revisions to the ATCM.

VI. REGULATORY ALTERNATIVES

The ARB staff evaluated alternative strategies to the current proposal. Based on the analysis, none of the alternative control strategies were considered more effective than the proposed regulation. Full implementation of the proposed regulation is necessary to achieve ARB's goal, as described in the Diesel Risk Reduction Plan, to reduce diesel PM emissions and associated potential cancer risks by 85 percent by 2020. The proposed regulation provides owners or operators of diesel-fueled portable engines with flexibility in determining the most cost-effective control strategy that will meet the proposed emission limits and/or operational requirements for their fleet.

A. Do Not Adopt This Regulation

With full implementation of the proposed regulation, diesel PM emissions will be reduced from portable diesel-fueled engines in California by 95 percent in 2020, relative to the 2000 baseline. If the regulation is not adopted and implemented, PM reductions—achieved through PERP, local air district permitting requirements, and natural engine attrition—would only be 57 percent by 2020. Because of the number and size of the engines currently in PERP and the requirement for PERP participants to have only certified engines by 2010, PERP alone would achieve a 50 percent diesel PM reduction by 2020. The proposed ATCM is designed to build upon the success of PERP. Currently, because of the Clean Air Act preemption for non-road engines, which was discussed in Chapter III, local air districts have limited authority to regulate portable engines. Therefore, if the proposed regulation is not fully implemented, substantial emission reductions will be forgone.

These estimated reductions in diesel PM from portable engines are an important element in the Diesel Risk Reduction Plan. This proposed ATCM, along with other diesel PM control measures to be adopted by the ARB, will result in reducing cancer and noncancer health risks to the public from inhalation exposure to diesel PM emissions. Short-term exposure to diesel PM emissions may cause acute or chronic noncancer respiratory effects such as irritation of the eyes, throat, and bronchial passages. Furthermore, inhalation of diesel PM emissions can cause neurophysiological symptoms, such as lightheadedness or nausea.

The ARB is required by H&SC Section 39658 to establish ATCMs for toxic air contaminants. Further, H&SC Section 39666 requires the ARB to adopt ATCMs to reduce emissions of TACs from nonvehicular sources. Considering the recognized detrimental public health impacts from exposure to diesel PM, and ARB's statutory requirements to protect public health, this alternative is not a reasonable option.

B. Risk Assessment Approach

One of the approaches ARB staff discussed with stakeholders was a concept to limit the hours of operation at a specific location, thereby capping the potential health risk at that location to less-than-significant risk levels. The operating-hour limits were based upon the potential risk posed by an engine using standard risk assessment procedures, which includes a 70-year exposure duration. All engines used on a specific project would have to share the available operating hours. The intent of this approach was to promote engine turnover, as cleaner engines received higher allowable operating hours per project.

This approach was abandoned because the operating restrictions were too restrictive for many projects, particularly projects using larger diesel-fueled portable engines; the recordkeeping requirements would have been substantial and onerous; and field enforcement would have been difficult and resource-intensive.

C. BACT Approach

Another approach considered in other ARB diesel-risk-reduction regulations was requiring the implementation of best available control technology (BACT). Fleet operators would be required to equip all diesel-fueled portable engines with BACT by a certain date. There would also be interim dates requiring a certain percentage of the fleet to meet the BACT requirement. For example, in the recently adopted ATCM for on-road heavy-duty residential and commercial solid waste collection vehicles, BACT was defined as: 1) an engine certified to an emission rate of 0.01 g/bhp-hr; 2) an alternative-fuel engine, and 3) a control system that has been approved by the Executive Officer via the verification procedure for in-use strategies to control emissions from diesel engines.

While this approach is workable for on-road applications, staff did not pursue the approach for portable engines, primarily due to the lack of available emission-reduction options for the off-road categories. For the on-road category, the control technologies are readily available. There are verified Level-3 control technologies commercially available, and new engines equipped with particulate filters at time of manufacture will be available in the near term. As discussed in the previous chapter, only one control technology has been verified for the off-road category—a diesel oxidation catalyst (DOC)—that achieves between 20-30 percent diesel PM reductions. New engines equipped with particulate filters at the time of manufacture will not be available until 2011 or later. Due to the wide range of portable diesel-fueled engine applications—from small compressors or pumps to large dredging or oil field workover engines—DOCs may not be applicable in many cases. Consequently, to achieve the 85 percent reduction goal identified in the Diesel Risk Reduction Plan, the BACT approach would force engine owners to initially retrofit some engines by a specific date with technologies that achieve only 20-30 percent reduction and then, by 2020,

require these retrofit engines to either be replaced with an engine certified to the applicable proposed Tier 4 off-road emission standard or be retrofitted again with a Level-3 control device or technique. This was not considered to be a cost-effective alternative to the proposed ATCM.

VII. ENVIRONMENTAL IMPACTS OF PROPOSED ATCM

This chapter describes the potential impacts that the proposed ATCM may have on air quality, wastewater treatment, and hazardous waste disposal. Based upon available information, the ARB staff has determined that no significant adverse environmental impacts should occur as a result of adopting the proposed ATCM.

A. Legal Requirements Applicable to the Environmental Impact Analysis

The California Environmental Quality Act (CEQA) and ARB policy require an analysis to determine the potential environmental impacts of proposed regulations. ARB's program for adopting regulations has been certified by the Secretary of Resources, pursuant to Public Resources Code section 21080.5. Consequently, the CEQA environmental analysis requirements may be included in the Initial Statement of Reasons (ISOR) for this rulemaking. In the ISOR, the ARB must include a functionally equivalent document, rather than adhering to the format described in CEQA of an Initial Study, a Negative Declaration, and an Environmental Impact Report. In addition, staff will respond, in the Final Statement of Reasons for the proposed ATCM, to all significant environmental issues raised by the public during the public review period or at the Board public hearing.

Public Resources Code section 21159 requires that the environmental impact analysis conducted by ARB include the following:

- An analysis of reasonably foreseeable environmental impacts of the methods of compliance;
- An analysis of reasonably foreseeable feasible mitigation measures; and
- An analysis of reasonably foreseeable alternative means of compliance with the ATCM.

Compliance with the proposed ATCM is expected to directly affect air quality and potentially affect other environmental media as well. Our analysis of the reasonable foreseeable environmental impacts of the methods of compliance is presented below.

B. Effects on Air Quality from Implementing the ATCM Requirements

The proposed ATCM will provide diesel PM emission reductions throughout California, including urban areas and those areas that are non-attainment for the State and federal ambient air quality standards for PM_{10} and $PM_{2.5}$. Air quality benefits will result from the reduction of NOx and ROG emissions as well. The projected emission reductions from the implementation of this ATCM are

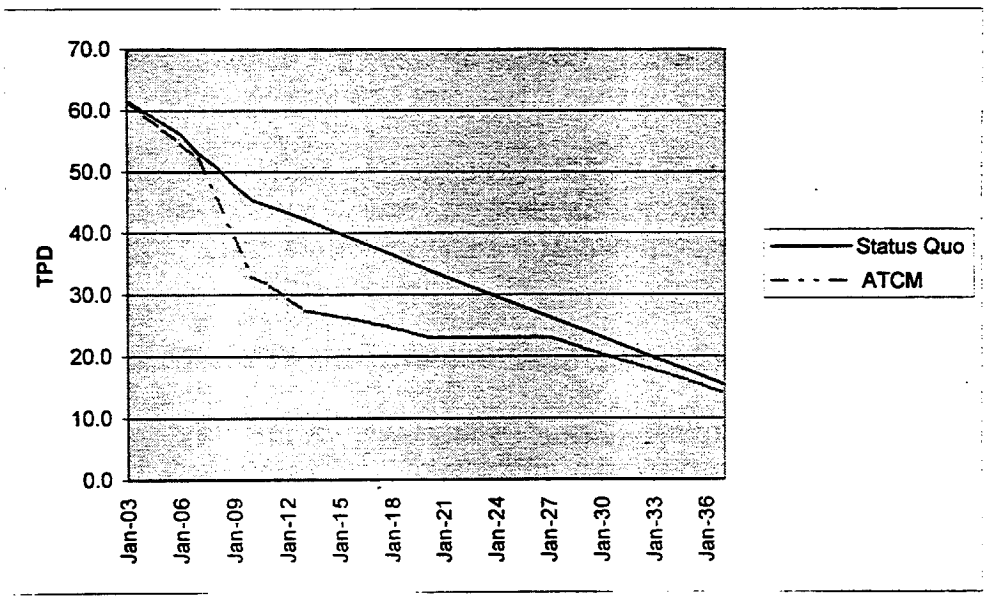
presented in Table VII-1. The percent reductions presented in Table VII-1 are the percent reductions from the 2000 base year. For example, the 2010 estimate for NOX emissions as a result of implementing the proposed ATCM is 33 TPD, which is a 51 percent reduction from the 2000 base year NOx emissions of 67 TPD.

Table VII-1: Projected Annual Emissions for 2010 and 2020 with Implementation of the Proposed ATCM

Year	Diesel PM Emissions (TPD)	Percent Reduction	NOx Emissions (TPD)	Percent Reduction	ROG Emissions (TPD)	Percent Reduction
2000	4.2	–	67	–	6.7	–
2010	2.0	52%	33	51%	4.6	30%
2015	1.3	69%	26	61%	2.9	57%
2020	0.2	95%	23	66%	1.2	78%
2037	0.2	95%	14	79%	1.2	78%

Figure VII-1 illustrates the projected emission reductions to year 2037 for NOx that are associated with the implementation of the ATCM. A similar figure for diesel PM reductions is given in Chapter V. The projected emission reductions is the difference between the NOx emissions from the status quo case (i.e., considering only the benefits of full PERP implementation and engine turnover) and the NOx emissions from implementing the proposed ATCM. As discussed previously, the NOx reductions realized are based upon the early replacement of engines with cleaner engines. Early engine replacement is expected to be the

Figure VII-1: Projection of NOx Emissions with and without ATCM Implementation



primary method to comply with the 2010 and 2013 requirements. Consequently, the peak reductions for NOx will occur between 2010 and 2020, with the greatest reduction in any one year occurring during 2013. Overall, the proposed ATCM will result in cumulative NOx reductions of 56,200 tons by 2020 and 81,000 tons by 2037. These reductions are in addition to the reductions achieved through PERP and natural attrition of older engines.

The proposed ATCM's NOx reductions are largely based upon replacing uncertified engines with Tier 2 and Tier 3 engines. Staff expects that these engines would subsequently be retrofitted with diesel PM emission reduction technologies that will not result in further NOx reductions. Greater reductions in NOx can be realized if fleet owners take advantage of the Tier 4 incentives in the proposed ATCM.

C. Health Benefits of Reductions of Diesel PM Emissions

The emission reductions obtained from this regulation will result in lower ambient diesel PM levels and significant reductions of exposure to primary and secondary PM. Lower ambient PM levels and reduced exposure, in turn, would result in a reduction of the prevalence of the diseases attributed to PM and diesel PM including, reduced incidences of hospitalizations for cardio-respiratory disease, and prevention of premature deaths.

Primary Diesel PM

Lloyd and Cackette (2001)[3] estimated that ambient diesel $PM_{2.5}$ exposures at a level of 1.8 $\mu g/m^3$ resulted in a mean estimate of 1,985 (974-2,991 as 95 percent confidence interval (95% CI)) cases of premature deaths per year in California. This result is based on calculations using Appendix D of U.S. EPA's report to the U.S. Congress on the benefits and costs of air pollution regulations (U.S. EPA, 1999) and on the relative risk value for mortality from $PM_{2.5}$ exposure reported by Krewski *et al.*(Krewski, 2000). In Table 31 of Part II of Krewski's publication, a relative risk of 1.12 (all causes of death) for $PM_{2.5}$ exposure is reported. This risk is associated with a mean change of 24.5 $\mu g/m^3$ in PM concentration, as stated on page 97 of the report. These values were used in equation (5) of Appendix D of the U.S. EPA document, which states the relationship between the coefficient beta, relative risk, and change in PM concentration. For these calculations, the

[3] Although there are two mortality estimates in the report by Lloyd and Cackette – one based on work by Pope *et al.* (1995) and the other based on Krewski *et al.* (2000), we selected the estimate based on the Krewski's work. For Krewski *et al.* (2000), an independent team of scientific experts commissioned by the Health Effects Institute conducted an extensive reexamination and reanalysis of the health effect data and studies, including Pope *et al.* The reanalysis resulted in the relative risk being based on changes in mean levels of $PM_{2.5}$, as opposed to the median levels from the original Pope *et al.* study. The Krewski *et al.* (2000) reanalysis includes broader geographic areas than the original study (63 cities vs. 50 cities). Further, the U.S. EPA has been using Krewski's study for its regulatory impact analyses since 2000.

health risks from diesel PM exposure are assumed to be the same as the health risks from ambient $PM_{2.5}$. This assumption is supported by the fact that almost all diesel PM is 2.5 μg or smaller in size, and by the many studies in numerous cities that show a strong association between mortality and exposure to a wide range of combustion-related $PM_{2.5}$, including those considered markers of pollution from diesel exhaust (CARB, 2002b). The diesel PM emissions corresponding to the direct diesel ambient population-weighted PM concentration of 1.8 $\mu g/m^3$ is 28,000 tons per year (CARB, 2000b). Based on this information, we estimate that reducing 14 tons per year of diesel PM emissions would result in one fewer premature death.

Although the implementation date for the final diesel PM emission standards in the proposed regulation is 2020, the ARB staff believes that the full benefits of the diesel PM standard requirements will extend to 2037. Comparing the diesel $PM_{2.5}$ emissions before and after full implementation of this regulation, the proposed regulation is expected to reduce emissions, cumulatively, by 10,800 tons by the end of year 2037, and therefore prevent an estimated 770 premature deaths (377-1,158,95% CI) by year 2037. Prior to 2037, cumulatively, it is estimated that 50 premature deaths (25-76, 95% CI) would be avoided by 2010 and 339 (166-511, 95% CI) by 2020. Additional health benefits are expected from the reduction of NOx emissions, which give rise to secondary PM from the conversion of NOx to $PM_{2.5}$ nitrate.

To estimate the cost of control per premature death prevented, we multiply the estimated tons of diesel PM that would result in one fewer premature deaths (14 tons per year) by the average present value of cost-effectiveness ($9.76 per pound diesel PM or $19,500 per ton). The resulting estimated cost of control per premature death prevented is about $275,000 in 2002 dollars. The U.S. EPA has established $6.3 million (in year 2000 dollars) for a 1990 income level as the mean value of avoiding one death (U.S. EPA, 2003a). As real income increases, the value of a life may rise. U.S. EPA further adjusted the $6.3 million value to $8 million (in 2000 dollars) for a 2020 income level. Assuming that real income grew at a constant rate from 1990 and will continue at the same rate to 2037, we adjusted the value of avoiding one death for the income growth. Since the control cost is expressed in 2002 discounted value, accordingly, we discounted values of avoiding a premature death in the future back to the year 2002. In U.S. EPA's guidance of social discounting, it recommends using both three and seven percent discount rates (U.S. EPA, 2000a). Using these rates, and the annual avoided deaths as weights, the weighted average value of reducing a future premature death discounted back to year 2002 is $2.44 million (using 2037 as the end year of analysis) at seven percent discount rate, and $4.78 million at three percent. The cost range per death avoided because of this proposed regulation (i.e., $275,000) is 9 to 17 times lower than the U.S. EPA's benchmark for value of avoided death. Based on this analysis, the proposed rule is a cost-effective mechanism to reduce premature deaths that would otherwise be caused by diesel PM emissions.

The benefits of reducing diesel emissions are based on a statewide average diesel emission value, such as in the Lloyd and Cackette analysis, which contains off-road emissions from a number of categories that occur well away from population centers. Portable diesel-fueled engines and their diesel emissions are more concentrated in urban areas, thus a greater reduction of the emissions as a result of the proposed regulation are expected to occur in urban areas, as compared to rural areas. Emission reductions are, therefore, likely to have greater benefits than those estimated by Lloyd and Cackette. Thus, the proposed ATCM is likely to be more cost-effective than the above estimate would suggest.

Secondary PM

Lloyd and Cackette also estimated that $PM_{2.5}$ exposures due to diesel NOx emissions at a level of 0.81 $\mu g/m^3$ resulted in a mean estimate of 895 additional premature deaths per year in California, above those caused by directly emitted diesel PM. The NOx emission levels corresponding to the indirect diesel ambient PM concentration of 0.81 $\mu g/m^3$ is 1,640 tpd (599,000 tpy). Following the same approach as described above, we estimate that reducing 670 tons of NOx emissions would result in one fewer premature death (890 deaths* 670 tons/599,000 tons). Therefore, with the 82,600-ton reduction of NOx that is expected by the end of 2037, an estimated 124 (61-186, 95% CI) deaths would be avoided.

If we multiply 670 tons of NOx emissions by the average present value of cost-effectiveness of $1.30 per pound NOx (or $2,600 per ton), the estimated cost of control per premature death prevented is about $1.74 million. The cost is again lower than the U.S. EPA's present value of an avoided death by 1.4 to 2.7 times.

Reduced Ambient Ozone Levels

Emissions of NOx and ROG are precursors to the formation of ozone in the lower atmosphere. Exhaust from diesel engines contributes a substantial fraction of ozone precursors in any metropolitan area. Therefore, reductions in NOx and ROG from diesel engines would make a considerable contribution to reducing exposures to ambient ozone. Controlling emissions of ozone precursors would reduce the prevalence of the types of respiratory problems associated with ozone exposure and would reduce hospital admissions and emergency visits for respiratory problems.

D. Analysis of Reasonably Foreseeable Environmental Impacts of the Methods of Compliance

The proposed ATCM sets diesel PM emission rates that are based on a fleet-weighted emissions average. The proposed requirements provide the fleet

owner flexibility with choosing options to reduce diesel PM emissions from an individual fleet to meet the required standards. An owner may choose to retrofit existing engines using a number of control technologies. These technologies include diesel oxidation catalysts (DOC), diesel particulate filters (DPF), and alternative diesel fuel. The ARB staff evaluated the potential impacts that these control technologies may have on wastewater treatment and hazardous waste disposal. As described below, options are available to mitigate these potential adverse impacts.

Diesel Oxidation Catalyst (DOC)

Two potential adverse environmental impacts of the use of diesel oxidation catalysts have been identified. First, as is the case with most processes that incorporate catalytic oxidation, the formation of sulfates increases at higher temperatures. Depending on the exhaust temperature and sulfur content of the fuel, the increase in sulfate particles may offset the reductions in soluble organic fraction emissions. Using low sulfur diesel fuel can minimize this effect. Second, a diesel oxidation catalyst could be considered a "hazardous waste" at the end of its useful life depending on the materials used in the catalytic coating. Because catalytic converters have been used on gasoline powered on-road vehicles for many years, there is a very well established market for these items (see, for example, http://www.pacific.recycle.net – an Internet posting of buyers and sellers of various scrap materials). In the recycling process, the converters are broken down, and the metal is added to the scrap-metal stream for recycling, while the catalysts (one or a combination of the platinum group metals) are extracted and reused.

Because of platinum's high activity as an oxidation catalyst, it is the predominant platinum group metal used in the production of diesel oxidation catalysts. There is a very active market for reclaimed platinum for use in new catalytic converters, jewelry, fuel cells, cathode ray tube screens, catalysts used during petroleum refining operations, dental alloys, oxygen sensors, platinum electrode spark plugs, medical equipment, and platinum-based drugs for cancer treatment, to name a few (Kendall, 2002; Kendall, 2003).

Catalyzed Diesel Particulate Filters

These devices are composed of a ceramic diesel particulate filter along with a platinum catalyst to catalyze the oxidation of carbon-containing emissions and significantly reduce diesel PM emissions. This is an obvious positive environmental impact.

However, there are also inorganic solid particles present in diesel exhaust, which are captured by diesel particulate filters. These inorganic materials are metals derived from engine oil, diesel fuel, or engine wear and tear. While the PM filter

is capable of capturing inorganic materials, these materials are not oxidized into a gaseous form and expelled.

Because these materials would otherwise be released into the air, the filters are benefiting the environment by capturing these metallic particles, known as "ash." However, the ash that is collected in the PM filter must be removed from the filter periodically to maintain the filter's effectiveness.

Ash collected from a diesel engine using a typical lubrication oil and no fuel additives has been analyzed and is primarily composed of oxides of the following elements: calcium, zinc, phosphorus, silicon, sulfur, and iron. Zinc is the element of primary concern because, if present in high enough concentration, it can make a waste a hazardous waste. Title 22, CCR, section 66261.24 establishes two limits for zinc in a waste: 250 milligrams per liter for the Soluble Threshold Limit Concentration and 5,000 milligrams per kilogram for the Total Threshold Limit Concentration. The presence of zinc at or above these levels would cause a sample of ash to be characterized as a hazardous waste.

Under California law, it is the generator's responsibility to determine whether their waste is hazardous or not. Applicable hazardous waste laws are found in the H&SC, division 20; title 22, CCR, division 4.5; and title 40 of the Code of Federal Regulations. Staff recommends owners that install a diesel particulate filter on an engine to contact both the manufacturer of the diesel emission control system and the California Department of Toxic Substances Control (DTSC) for advice on proper waste management.

ARB staff has consulted with personnel of the DTSC regarding management of the ash from diesel particulate filters. DTSC personnel have advised ARB that it has a list of facilities that accept waste from businesses that qualify as a conditionally exempt small quantity generator. Such a business can dispose of a specific quantify of hazardous waste at certain Household Hazardous Waste events, usually for a small fee. An owner who does not know whether or not he qualifies or who needs specific information regarding the identification and acceptable disposal methods for this waste should contact the California DTSC.[4]

High-pressure water and detergent is sometimes used to remove ash from DPFs. However, this practice would generate wastewater containing metal oxides, possibly being hazardous waste, that could not be discharged to the sanitary sewer or storm drains. Technology exists to reclaim zinc from waste. For example, the Swedish company MEAB has developed processes for extracting zinc and cadmium from various effluents and industrial waste streams (MEAB, 2003). Whether reclamation for reuse will be economically beneficial remains to be seen. Some DPF cleaning techniques can cause ash to be illegally released

[4] Information can be obtained from local duty officers and from the DTSC web site at http://www.dtsc.ca.gov.

directly into the air/or work environment potentially exposing the public and/or workers to zinc and other metal oxides.

Because of the time and costs associated with filter maintenance, there are also efforts by industry to reduce the amount of ash formed. Most of the ash is formed from the inorganic materials in engine oil, particularly from zinc-containing additives necessary to control acidification of engine oil—due in part to sulfuric acid derived from sulfur in diesel fuel. As the sulfur content of diesel fuel is decreased, the need for acid neutralizing additives in engine oil should also decrease. A number of technical programs are ongoing to determine the impact of changes in oil ash content and other characteristics of engine oil on exhaust emission control technologies and engine wear and performance.

It may also be possible to reduce the ash level in diesel exhaust by reducing oil consumption from diesel engines. Diesel engine manufacturers over the years have reduced engine oil consumption in order to reduce PM emissions and to reduce operating costs for engine owners. Further improvements in oil consumption may be possible in order to reduce ash accumulation rates in diesel particulate filters.

In addition, measurements of NOx emissions for heavy-duty diesel vehicles equipped with passive catalyzed filters have shown an increase in the NO_2 portion of total NOx emissions, although the total NOx emissions remain approximately the same. In some applications, passive catalyzed filters can promote the conversion of nitrogen oxide (NO) emissions to NO_2 during filter regeneration. More NO_2 is created than is actually being used in the regeneration process; and the excess is emitted. The NO_2 to NOx ratios could range from 20 to 70 percent, depending on factors such as the diesel particulate filter systems, the sulfur level in the diesel fuel, and the duty cycle (DaMassa, 2002).

Formation of NO_2 is a concern because it irritates the lungs and lowers resistance to respiratory infections. Individuals with respiratory problems, such as asthma, are more susceptible to the effects. In young children, nitrogen dioxide may also impair lung development. In addition, a higher NO_2/NOx ratio in the exhaust could potentially result in higher initial NO2 concentrations in the atmosphere which, in turn, could result in higher ozone concentrations.

Model simulations have shown that a NO_2 to NO_X emission ratio of approximately 20 percent would nearly eliminate any impact of increased NO_2 emissions (DaMassa, 2002). According to the model, at the NO_2 to NOx ratio of 20 percent, there will be a decrease of the 24-hour ozone exposure (greater than 90 parts per billion) by two percent while an increase of the peak 1-hour NO_2 by six percent (which is still within the NO_2 standard).

The health benefits derived from the use of PM filters are immediate and offset the possible adverse effects of increases in NO_2 emissions. For this reason, a cap of 20 percent NO_2 to NOx emission ratio was established for all diesel emission control systems through ARB's Verification Procedure. The proposed ATCM allows only verified PM control technology to be used on portable engines in order to meet the diesel PM emission standards.

In addition, DPFs can emit carbon dioxide (CO_2), a greenhouse gas, as a result of oxidizing PM. The contribution of CO_2 emissions from diesel-fueled portable engines using DPFs, and how much these emissions contribute to global warming, is unknown.

Alternative Fuels

Alternative fuels and alternative diesel fuels can also be used to reduce diesel PM emissions. Alternative fuels can include natural gas, propane, methanol, or ethanol. Alternative diesel fuels include biodiesel and Fischer-Tropsch fuels. No significant negative environmental impacts have been determined from the use of alternative fuels; however, the use of biodiesel can result in a slight increase in NOx emissions (Hofman/Solseng, 2002).

To ensure there are no adverse impacts from the use of alternative diesel fuels, the proposed ATCM requires any alternative diesel-fuel or fuel additives used in a diesel-fueled portable engine to be verified under the ARB's Verification Procedure, which is discussed in Appendix E. The Verification Procedure permits a control technology to be verified only if a multimedia evaluation of the use of the alternative diesel fuel or additive has been conducted. In addition, verification requires a determination by the California Environmental Policy that such use will not cause a significant adverse impact on public health or the environment pursuant to Health and Safety Code section 43830.8 (see Public Resource Code, section 71017).

Potential Impacts from Proposed Incentives

The proposed ATCM provides several incentives to encourage repowering or replacement of higher-emitting engines as part of the fleet reduction approach. The ARB staff evaluated the potential environmental impacts that these incentives may create.

One proposed incentive provides a credit toward satisfying a fleet-weighted standard by allowing, under certain circumstances, alternative-fueled engines to be included in the fleet-weighted diesel PM emissions calculations. Alternative fuels could include methane, butane and gasoline. The ARB staff expects limited use of this credit because these engines, which are mostly spark ignited, are generally more expensive, have a shorter useful life than diesel-fueled (compression ignition) engines, and are more difficult to refuel in field operations.

In the limited cases where alternative-fueled engines are added to the fleet, staff would expect a reduction in diesel PM emissions and would expect minimal change to NOx emissions. The NOx emission standards for large spark ignition engines are comparable to Tier 3 off-road engine standards but are slightly higher than the proposed Tier 4 off-road engine standards.

Another incentive allows credit for applications where grid power is used in lieu of operating a portable diesel-fueled engine. The emission rate for those engines replaced with electrification can be reduced in the fleet-weighted diesel PM emissions calculations based on the amount of hours per year grid power is used as compared to the hours per year the diesel-fueled engine is operated.

Staff does not expect to see wide-use of this credit because electrification is likely to be used in only limited applications such as in dredging activities, ground support activities at airports, and cement and aggregate operations. When electrification is used, it would increase demand on the grid, which in turn would increase emissions from power plants, primarily NOx emissions. However, NOx emissions from power plants are much cleaner than NOx emissions from diesel-fueled engine. Thus, staff would expect a reduction in diesel PM emissions and a slight reduction in NOx emissions when electrification is used to comply with the fleet-weighted diesel PM emissions calculations.

E. Reasonably Foreseeable Mitigation Measures

CEQA requires an agency to identify and adopt feasible mitigation measures that would minimize any significant adverse environmental impacts described in the environmental analysis. The ARB staff has concluded that no significant adverse environmental impacts should occur from adoption of and compliance with the proposed ATCM. Therefore, no mitigation measures would be necessary.

F. Reasonably Foreseeable Alternative Means of Compliance with the Proposed Airborne Toxic Control Measure

Alternatives to the Proposed ATCM are discussed in Chapter V of this Staff Report. The ARB staff has concluded that the proposed ATCM provides the most effective and least burdensome approach to reducing the public's exposure to diesel PM and other air pollutants emitted from diesel-fueled portable engines.

G. Environmental Justice

The ARB is committed to integrating environmental justice in all of its activities. On December 13, 2001, the Board approved "Policies and Actions for Environmental Justice," which formally established a framework for incorporating Environmental Justice into the ARB's programs, consistent with the directive of California state law. Environmental Justice is defined as the fair treatment of people of all races, cultures, and incomes with respect to the development,

adoption, implementation, and enforcement of environmental laws, regulations, and policies. These policies apply to all communities in California, but recognize that environmental justice issues have been raised more in the context of low-income and minority communities.

The Environmental Justice Policies are intended to promote the fair treatment of all Californians and cover the full spectrum of the ARB's activities. Underlying these Policies is a recognition that the agency needs to engage community members in a meaningful way as it carries out its activities. People should have the best possible information about the air they breathe and what is being done to reduce unhealthful air pollution in their communities. The ARB recognizes its obligation to work closely with all communities, environmental and public health organizations, industry, business owners, other agencies, and all other interested parties to successfully implement these Policies.

During the ATCM development process, the ARB staff proactively identified and contacted representatives from engine and diesel emission control associations, portable fleet owners and associations, environmental organizations, and other parties interested in portable engines. These individuals participated by providing data, reviewing draft regulations, and attending public forum meetings, in which staff directly addressed their concerns.

The proposed ATCM is consistent with the environmental justice policy to reduce health risks from TACs in all communities, including those with low-income and minority populations, regardless of location. Portable engines are used in urban and rural communities. Because they are used for a number of activities throughout the State, the risk posed by these engines may potentially impact all communities in California. Limiting diesel PM emissions from diesel-fueled portable engines in California will provide air quality benefits to all communities in the State, including low-income and minority communities.

H. Use of CEQA to Further Mitigate Diesel PM Emissions from Portable Diesel-Fueled Engines

Implementation of the proposed ATCM will result in significant reduction of diesel PM throughout the State, and therefore will reduce the public's exposure to diesel PM. Nevertheless, for situations where numerous diesel-fueled portable engines or very large engines are used for a long-term project, additional mitigation should be considered. For example, large construction projects would likely use numerous pieces of portable equipment, such as welders, compressors, and generators on-site for several weeks or months. Although the proposed ATCM will reduce diesel PM for all portable diesel-fueled engines larger than 50 horsepower in California, local air districts can further address the impacts of these large projects through the CEQA (California Environmental Quality Act) process.

CEQA provides a public process where a project's potential environmental impacts are discussed and, as necessary, potential mitigation measures are identified and implemented for the project. A major benefit provided by the CEQA process is that the impacts and the necessary mitigation measures are identified prior to beginning the project. This is where the local air districts can comment on the air-quality impacts of portable diesel-fueled engines and recommend specific mitigation measures.

Although many times the emissions from portable engines comprise a small percentage of the total diesel PM emissions from a construction project, additional mitigation measures for these engines can include: requiring only newer, cleaner diesel engines to be used on the project; expediting the electrical hookup to the grid as soon as practicable to minimize the need for diesel-fueled portable equipment; and requiring the use of alternative-fueled portable engines, such as propane.

Since each large construction project may have its unique circumstances, and the regulatory management of 33,000 engines statewide must necessarily be broad, the CEQA process is appropriate for addressing specific air-quality issues related to large projects that employ numerous and/or large portable diesel-fueled engines.

The ARB staff will continue to work with the local air districts on identifying air-quality impacts of large projects and recommending possible mitigation measures through the CEQA process.

VIII. ECONOMIC IMPACTS OF PROPOSED ATCM

In this chapter ARB staff presents an analysis of the estimated costs and impacts associated with implementation of the proposed ATCM. The expected capital and recurring costs for the potential compliance options are presented, as well as an analysis of the cost effectiveness of the proposed ATCM. The costs and associated impacts are presented for private companies and governmental agencies.

A. Summary of the Economic Impacts

ARB staff estimates the total cost of the proposed ATCM to affected businesses and government agencies to vary between $2 to $34 million per year, averaging $15 million per year. The economic impact is distributed over a 30-year period to 2037.

Overall, most affected businesses will be able to absorb the costs of the proposed regulation with no significant adverse impacts on their profitability. This finding is based upon staff's estimated change in "return on owner's equity" (ROE) analysis. The analysis found that the overall change in ROE ranges from negligible to a decline of about 7 percent. Because the proposed ATCM would not alter significantly the profitability of most businesses, we do not expect a noticeable change in employment, business creation, elimination, or expansion, and business competitiveness in California. We also found no significant adverse economic impacts on local or State agencies.

The overall estimated cost effectiveness of the proposed ATCM, considering only the benefits of reducing diesel PM is between $16/lb and $19/lb. Since the proposed ATCM will also result in reductions of ROG and NOx emissions, ARB staff allocated half of the costs of compliance against these benefits, resulting in cost effectiveness values of between $8/lb and $10/lb for diesel PM and less than $2/lb of ROG and NOx reduced.

The estimated cost of control per premature death prevented by the proposed ATCM is $ 275,000 in 2020 dollars. Using U.S. EPA's established value for avoiding a premature death, $2.44 million (using 2037 as the end year of analysis) at seven-percent discount rate, and $4.78 million at three percent, both values discounted back to year 2002, the cost range per death avoided because of this proposed regulation is 9 to 17 times lower than the U.S. EPA's benchmark for value of avoided death. Based on this analysis, the proposed rule is a cost-effective mechanism to reduce premature deaths that would otherwise be caused by diesel PM emissions.

B. Legal Requirements

In this section, we explain the legal requirements that must be satisfied in analyzing the economic impacts of the ATCM.

Section 11346.3 of the Government Code requires State agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulation. The assessment shall include a consideration of the impact of the proposed regulation on California jobs, business expansion, elimination or creation, and the ability of California businesses to compete with businesses in other states.

Also, State agencies are required to estimate the costs or savings to any State or local agency and school district in accordance with instructions adopted by the Department of Finance (DOF). The estimate shall include any non-discretionary costs or savings to local agencies and the costs or savings in federal funding to the State.

Finally, Health and Safety Code section 57005 requires the ARB to perform an economic impact analysis of submitted alternatives to a proposed regulation before adopting any major regulation. A major regulation is defined as a regulation that will have a potential cost to California business enterprises in an amount exceeding $10 million in any single year. Because the estimated cost of the ATCM exceeds $10 million in a single year, the proposed ATCM is a major regulation. Following is a description of the methodology used to estimate costs and ARB staff's analysis of the economic impacts on California businesses and State and local agencies.

C. Methodology for Estimating Costs Associated with Implementation

This section provides the general methodology and assumptions used to estimate the costs associated with the ATCM. In this section, we describe how we estimated the number and types of engines, and the costs of bringing these engines into compliance with the proposed ATCM.

Overview

As discussed in Chapter V, compliance with the proposed ATCM would be phased in over a period beginning 2008-2009 with full compliance by January 1, 2020. However, both the emissions reductions and the costs associated with satisfying the proposed ATCM requirements occur over a longer period of time. The reductions associated with complying with the proposed ATCM begin before 2010 and continue through 2037. These reductions result from the early replacement of the existing portable engine fleet with cleaner engines and the subsequent retrofitting of additional engines. Anticipated costs associated with

the proposed ATCM will begin in 2005, with fees associated with the permitting/registration of engines previously exempted from district permit requirements. The costs associated with the proposed ATCM continue beyond January 1, 2020, when the regulation is fully implemented, and do not end until 2037, when the costs and benefits associated with the proposed ATCM have been fully achieved.

The initial economic impact of the proposed ATCM is associated with the lost economic value from replacing engines prior to the end of their useful life (for compliance with the 2010 and 2013 requirements). Subsequent costs to satisfy the fleet emission goals of 2017 and 2020 are associated with add-on retrofit systems.

A more detailed discussion of the methodology used to determine the economic impact of the proposed ATCM is given below. Table VIII-1 summarizes the major assumptions used in this cost analysis.

Treatment of Costs Associated with Proposed ATCM

The major factors affecting the economic impact of the proposed ATCM are: 1) the number and characteristics (i.e., horsepower rating, emission rate, age of the affected engines) of engines affected; 2) changes in the overall portable diesel-fueled engine population due to implementation of the proposed ATCM; 3) the cost and timing of early replacement of engines before the end of their useful lives; and 4) the cost and timing associated with the addition of diesel PM control technologies.

The number of affected engines is based upon the engine populations used to estimate the emissions for 2000 for large off-road compression-ignition engines. Information for engines registered with ARB's Portable Equipment Registration Program (PERP) was used to characterize the affected engines. Additional details on the affected engines are given in Appendix G.

As discussed previously, the proposed regulation will require the early replacement of existing portable diesel-fueled engines with newer, cleaner engines. The cost attributed to engine replacement or repower would be the economic value to the owner for each year the engine has been prematurely replaced. Information for expected engine life used for the emissions inventory suggests that the useful life of a diesel-fueled portable engine is about 25 years—which is also supported by the age of engines that are registered with the PERP. The lost useful life would be the difference between 25 years and the average age of the affected engines at the time a standard becomes effective that forces the replacement of the engines. The average age of each affected group of engines was based upon the age of engines for similar types of engines registered with the PERP. For example, to comply with the 2010 requirement, the average age of the affected portable engines being replaced will be 20

years—the affected engines will then be replaced about five years before the end of their useful life. Conversely, for the purposes of this analysis, engines that are more than 25 years old have reached the end of their useful life, and no cost was include in the economic impact of the proposed ATCM for the replacement of this group of engines.

To estimate the economic impact caused by early replacement of portable engines, staff estimates the annual value for each year of lost useful life as the cost of the engine annualized over a 25-year period. The cost to replace or repower a portable engine is expected to range between $135-$220/horsepower. In the case of a 100 horsepower engine, the capital cost at the high end of the range would be $22,000 and the annualized cost for a 25-year period would be $1,600. The cost would apply initially in the year the emission standard became effect and for successive years for each year of lost useful life. Since the example engine was replaced to satisfy the proposed 2010 requirement, the economic impact would occur from 2010 through 2014 and the total cost is about $5,000, in 2002 dollars.

As discussed previously, all engines registered with PERP must be certified to off-road engine emission standards by January 1, 2010. Consequently, the costs and benefits for the ATCM do not include replacement requirements for engines registered with the PERP.

The use of verified Level-3 control technologies will provide an option to satisfy the proposed fleet standards that become effective by January 1, 2017. For the purposes of evaluating the economic impact associated with these standards, the cost is based upon retrofitting the engines with diesel PM particulate filters. The cost of a filter is estimated at $40/horsepower and this cost would be annualized over a 10-year period. Based upon current manufacturer's guarantees of 8,000 hours of use for a particulate trap and the average operation of a portable diesel-fueled engine, the particulate trap could have a useful life of up to 16 years. In some cases, an additional particulate trap was included in the cost analysis.

The cost analysis was calculated using 2002 dollars. Where future costs are mentioned, they have been discounted back to 2002 dollars using standard accepted economic procedures. An annual real interest rate of five percent is used. This is consistent with California Department of Finance recommendations for this type of analysis. Additional details on the cost analysis can be found in Appendix G.

D. Potential Compliance Options and Related Capital and Recurring Costs

The compliance costs for the proposed ATCM will vary depending upon the method used to satisfy each proposed fleet emission standard. A brief

Table VIII-1: Cost and Key Assumptions Used in the Cost Analysis

Category	Assumptions
All	▪ An annual 5% real interest rate is basis of all economic impacts, assuming 7% nominal interest rate and 2% inflation rate ▪ Total capital costs for control equipment are amortized over 10 years and useful life control equipment is 15 years ▪ Useful life for an engine is 25 years; cost due to early replacement of engine is based upon: 1) number of years displaced due to early replacement and 2) economic value for each year is based the annual payments for the case where the capital cost of engine is amortized over 25 years ▪ Engines older than 25 years at time of forced replacement is assumed to be at the end of its useful life ▪ Cost of replacing or repowering equipment is $135-220/horsepower ▪ Cost of diesel particulate trap is $40/horsepower; useful life is 16 years
Agriculture	▪ Cost is based upon value lost due to early replacement of engine. ▪ Engine hp is 100 and at time of replacement, five years of useful life left
Government	▪ Engines in this group is evaluated based upon both value lost due to early replacement of engine and the fiscal impact from purchasing equipment ▪ Both information from engines registered with PERP and results of a survey to public agencies were used to characterize the affected engines ▪ Over 60% of equipment would be considered emergency or low-use engines ▪ For the fiscal impact, the annual costs are the sum of the amortized capital cost and the annual maintenance and operation costs. ▪ For engines registered with PERP, the cost for compliance with the 2010 requirement is not included in the economic impact of the proposed ATCM
Private Business	▪ Cost is based upon value lost due to early replacement of engine. ▪ For engines not registered with PERP, assume statistical information from PERP (excluding engines used in dredging, oil well servicing, and rental) is representative (engine size and age of engine). ▪ For engines registered with PERP, the cost for compliance with the 2010 requirement is not included in the economic impact of the proposed ATCM

discussion of the proposed compliance options that may be used to comply with each of the proposed fleet emission standards, the estimated capital and recurring costs, and the assumptions used in the cost analysis follows.

Proposed 2010 Requirement

The proposed ATCM requires all portable diesel-fueled engines to be certified to an off-road engine emission standard by January 1, 2010. Engines that are registered with PERP are already subject to this requirement. The proposed ATCM would require all portable diesel-fueled engines to meet the same requirement.

Staff estimates that about 11,500 engines will be affected by this requirement. By the beginning of 2010, these engines will have operated for an average of 20 years. Staff anticipates most portable engine fleet owners will replace these engines predominately with Tier 3 engines for engines that are less than 750 horsepower and Tier 2 engines for engines that are 750 horsepower and larger.

For engines less than 750 horsepower, Tier 2 engines have been available since 2003. Tier 3 engines—available by 2008 in all size categories less than 750 horsepower—will have the same PM standard as the Tier 2 engines; however, Tier 3 engines are expected to emit about 30 percent less NOx, which is a significant consideration for reducing ozone concentrations.

For the engines that are 750 horsepower and larger, manufacturers are not required to satisfy more stringent PM standards until 2006. Requiring all engines to be certified by 2010 allows this group of engines sufficient time such that all uncertified engines can be replaced with the Tier 2 engine instead of a Tier 1 engine. The Tier 2 engines are 60 percent cleaner than a Tier 1 engine on a PM basis and 35 percent cleaner on a NOx basis.

Proposed 2013 Fleet Standard

The initial fleet standard becomes effective January 1, 2013. While the fleet standard provides flexibility to owners of portable diesel-fueled engines to use a range of options to satisfy the fleet standards, this analysis is based on the use of engine replacements or repowers. The standards are set such that most Tier 1 engines less than 750 horsepower will need to be replaced, which would affect about 6,000 engines. By the beginning of 2013, these engines will have operated 9-17 years, or would have a remaining useful life of 8-16 years.

For engines that are less than 175 horsepower, the Tier 1 engines would be replaced mainly with Tier 3 engines. For engines rated from 175 horsepower to 749 horsepower, staff expects the Tier 1 engines would be replaced with engines certified to the proposed Tier 4 standards. Based upon the U.S. EPA proposal, Tier 4 engines would be available in this classification beginning in 2011.

For engines rated at 750 horsepower or larger, the proposed 2013 fleet standards are not expected to cause most owners to replace or retrofit engines of this size.

Proposed 2017 and 2020 Fleet Standards

The 2017 and 2020 fleet standards represent a significant reduction in emissions from the 2010 fleet standard—a reduction in diesel PM of 50 percent or more. About 30,000 engines will be affected by these standards. This analysis is based on fleet owners relying on retrofits with Level-3 verified technologies to satisfy these standards.

Maintenance

Maintenance costs in the economic impact analysis for the proposed ATCM include the cost associated with maintaining the diesel particulate filters. On average, this cost was estimated to be $300 per engine on an annual basis, based on a qualified mechanic taking 2-3 hours to perform the maintenance. Staff did not take any credit for the assumed decrease in maintenance resulting from the older engines being replaced with new engines.

Recordkeeping and Reporting Requirements

Costs associated with recordkeeping will depend upon the number of engines, if any, in the fleet that are subject to individual recordkeeping requirements. Staff believes that most portable diesel-fueled engines will not be subject to individual recordkeeping requirements. In addition, the recordkeeping and reporting requirements of the proposed ATCM will not begin until January 1, 2010.

For fleets that do not have any engines subject to recordkeeping, the recordkeeping consists of tracking the composition of the fleet and the emission factors associated with the engines in the fleet. Staff estimates that companies and public agencies would use between one to two hours a month to maintain the information for the fleet. For larger fleets, initial development of the system to track the necessary information may take up to 10 hours. Based on these assumptions, the annual cost for recordkeeping would be between $300 to $600 per year with initial set up costing no more than $250.

Recordkeeping will be required for: alternative-fueled engines used to comply with fleet standards, engines affected by electrification if electrification is used to comply with the fleet standards, and engines designated as either emergency application only or low-use. For these engines, the owner/operator will be required to maintain the hours of operation for the engine on an annual basis. For this level of recordkeeping, staff believes one to two hours per year would be adequate to maintain this level of recordkeeping for a small- to moderate-sized

fleet (3 to 15 engines) at a cost of $50 a year. In a few cases, daily recordkeeping may be necessary. Four to twenty hours per year may be expended for each engine to adequately maintain daily records, at a cost of $100 to $500 per year.

Fleet owners/operators will be required to submit a status report to the Executive Officer of the ARB in 2011 and a compliance report for each year a new fleet emission standard becomes effective. The reports will require the submittal of information on the fleet to demonstrate compliance with any applicable emission standard, and requires the Responsible Official to certify that certain requirements are satisfied. Staff estimates that the typical company or agency (with fleets of 15 engines) will expend five hours preparing the reports, and up to 40 hours for larger fleets to prepare the information, resulting in costs of $125 to $1,000.

E. Potential Costs and Impacts to Private Companies

In this section, we estimate the costs and impacts on private companies from complying with the proposed ATCM. The analysis estimates the overall total statewide cost to private businesses, as well as the cost to a typical individual business, a typical small business, and the total costs to different sectors of the industry.

Description of Private Fleets

The ARB staff does not have access to financial records for most of the companies that would be affected by the proposed ATCM. Based upon information for companies registered with PERP, about 70 percent of the affected businesses would be considered small businesses. These small businesses own 10 percent of the engines registered with PERP.

Total Costs

We estimate the statewide total costs to private companies to be approximately $290-$340 million. Annually, the costs are expected to vary from $2 million to $29 million. The total statewide costs to private businesses are a combination of costs due to early replacement of existing engines, the installation of diesel PM reduction technologies, and registration fees for engines previously not required to operate with a permit. The costs of the diesel PM reduction technologies are derived from the combined present value capital, installation costs, equipment lifetime, and maintenance costs.

Costs to a Typical Small Business

Based on information for small businesses registered with PERP, small businesses typically own five or fewer engines, with the average small business

owning three engines. For a fleet of three engines, the total cost associated with complying with the proposed ATCM, including capital and ongoing costs, to a typical small business is estimated to be between $30,000 and $38,000. This cost would be distributed over a 19-year period, from 2010 through 2028. Annual costs would vary between $400 and $5,200 per year, with the average cost of $2,000 per year over this time period. There would be an additional cost for permitting fees of $270 per year, or $4,000 for the period the proposed ATCM is reducing diesel PM emissions, if the engines have not been previously subject to district permit requirements and therefore would need to be registered with PERP. An example of a cost analysis for a typical small business is included in Appendix H.

The cost to a typical small private business is derived from the average size, age, and number of engines owned. This cost can vary significantly depending upon the characteristics of the engines in the fleet. In the case of the example, the fleet consists of a certified 78 hp engine and two uncertified engines rated at 129- and 360-hp. The cost for compliance with the proposed ATCM would be higher if all the engines were newer engines being replaced with a significant portion of their useful life available. Conversely, the cost would be lower if the engines, at the time of replacement, were at the end of their useful life.

Recurring costs include costs associated with recordkeeping, reporting and maintenance. Cost associated with recordkeeping and reporting is dependent upon the type of engines in the fleet. No expenditure will be necessary for recordkeeping until after January 1, 2010. If none of the engines are subject to recordkeeping requirements for individual engines, recordkeeping will only be necessary for preparing submittals of reports to the ARB. Costs would be expected to be less than $100 per year. Similarly, maintenance costs will not be applicable until a control technology is added to the portable engine, sometime after 2010. Costs for maintaining a diesel particulate filter is estimated at $300 per year per filter, or about $900 for the typical small business.

The ARB staff estimates that overall, small businesses will incur a cost of $60-70 million to satisfy the requirements of the proposed ATCM.

Costs to a Typical Business

The total costs to a typical business complying with the proposed ATCM, including capital and ongoing costs, are estimated to be between $226,000 and $238,000. This cost would be distributed over a 28-year period, from 2010 to 2037. Annual costs would vary between $1,500 and $17,000 per year, with the average cost of $8,200 per year over this time period. In addition, typical businesses are already subject to district permitting requirements, and therefore no additional costs for permitting are included. The cost to a typical private business is derived from the average size, age, and number of engines owned. Based on information for businesses registered with PERP, a typical business

owns 15 engines. The cost for complying with the requirements of the proposed ATCM would be for the early replacement of these portable engines as well as the subsequent addition of retrofit technology. As discussed above, this cost can vary significantly depending upon the characteristics of the engines in the fleet.

Recurring costs include costs associated with recordkeeping, reporting and maintenance. Costs associated with recordkeeping and reporting are dependent upon the type of engines in the fleet. No expenditure will be necessary for recordkeeping until after January 1, 2010. If none of the engines are subject to recordkeeping requirements for individual engines, recordkeeping will only be necessary for preparing submittals of reports to the ARB. Costs would be expected to be less than $100 per year. Similarly, maintenance costs will not be applicable until a control technology is added to the portable engine, sometime after 2010. Costs for maintaining a diesel particulate filter is estimated at $300 per year per filter, or about $4,500 for the typical business.

Some companies registered with PERP own as many as 700 engines. However, the majority of these large engine fleets are owned by rental companies. The practice of most rental companies is to replace engines within their fleets over a short time period. Consequently, rental companies are generally expected to comply with the proposed requirements without any significant impact on their normal business practices. Other industry sectors with large fleets are the oil well services industry, large construction firms, and utilities. Most of these companies are registered with PERP and, as discussed above, are required to replace their engines as necessary such that all engines in the fleet are certified to off-road engine emission standards by January 1, 2010. ARB staff expects that most fleets subject to the proposed ATCM will have fewer engines than the typical fleet used to illustrate the impact of the proposed ATCM.

Costs and Impacts to Various Industry Sectors

ARB staff categorized the private businesses impacted by the proposed ATCM into nine categories. The industry categories are largely based upon the industries registered with PERP. These categories are agriculture, marine construction (including dredging), ground support equipment at airports, general industry applications, land-based construction, oil-well services industry, rental industry (including entertainment industry), utilities (including telecommunication), and recycling of wood wastes. The costs by industry are given in Table VIII-2 and the total costs to private businesses are expected to be about $290 to $340 million over the life of the regulation. Nearly 70 percent of the total costs of complying with the proposed ATCM will be in the construction, oil well services, and general-industry categories.

The methodology used to estimate the costs in Table VIII-2 is the same used to estimate the total statewide costs of the proposed ATCM, except that the individual industry sectors are analyzed separately. Once again, the costs

include only those directly caused by the proposed ATCM. Costs associated with complying with requirements of the PERP are not included. Finally, the proposed regulation provides a significant time period for the regulation to be fully implemented. The economic analysis reflects this by evaluating the impact of the proposed ATCM over a 30-year period.

Table VIII-2: Distribution of Total Costs for Private Businesses (Millions of Dollars)

Business Category	Estimated Total Statewide Costs
Agriculture	$21-27
Marine Construction	$5-6
Ground Support Equipment	$4-5
General Industry Applications	$43-51
Construction	$121-142
Oil Well Services Industry	$33-36
Rental	$19-22
Utilities	$14-17
Recycling of Wood Waste	$26-31

Potential Business Impacts

In this section we will analyze the potential impacts of the estimated costs of the proposed ATCM on private enterprises in California pursuant to the California Clean Air Act (CCAA). Section 11346.3 of the Government Code requires that, in proposing to adopt or amend any administrative regulation, state agencies shall assess the potential for adverse economic impact on California business enterprises and individuals. The assessment shall include a consideration of the impact of the proposed or amended regulation on the ability of California businesses to compete with businesses in other states, the impact on California jobs, and the impact on California business expansion, elimination, or creation.

This analysis is based on a comparison of the annual return on owner's equity (ROE) for affected businesses before and after the inclusion of the equipment costs, associated recurring costs, and fees. The analysis also uses publicly available information to assess the impacts on competitiveness, jobs, and business expansion, elimination, or creation. The purpose of this analysis is to indicate whether or not the annual costs would have significant adverse impacts on California businesses and individuals.

A wide range of businesses use diesel-fueled portable engines. The types of businesses that may be impacted include agribusiness, electric utilities,

telecommunication, motion picture and television, refiners, landfills, construction, manufacturing, oil-well servicing, military bases, airports, and industrial cleaning. The staff estimates that there are 2,800 businesses operating 33,000 diesel-fueled portable engines. A list of the affected industries is presented in Table VIII-3 along with their Standard Industrial Classification (SIC) Codes.

Table VIII-3: List of Industries with Affected Businesses

SIC Code	Industry
783	Ornamental shrub and tree services
1389	Oil and gas field services
1442	Construction sand and gravel
1542	General contractors—nonresidential buildings, other than industrial
1649	Heavy construction, not elsewhere classified
1795	Wrecking and demolition work
2951	Asphalt paving mixtures and blocks
3531	Construction machinery and equipment
4581	Airports, flying fields, and airport terminal services
4813	Telephone communications, except radiotelephone
4911	Electrical services
4931	Electric & other services combined
7812	Motion picture and video tape production

The approach used in evaluating the potential economic impact of the proposed ATCM on California businesses is as follows:

(1) All affected facilities are identified from companies registered with PERP. SIC codes identified by these businesses are listed in Table VIII-3.

(2) A sample of one to three typical businesses was selected from the facility list for each category.

(3) Annual costs for the proposed ATCM are estimated for each of these businesses based on the assumptions previously discussed.

(4) The total annual cost for each business is adjusted for both federal and states taxes.

(5) These adjusted costs are subtracted from net profit data and the results used to calculate the Return on Owners Equity (ROE). The resulting ROE is then compared with the ROE before the subtraction of the adjusted costs to determine the impact on the profitability of the businesses. A reduction of more than 10 percent in profitability is considered to indicate a potential for

significant adverse economic impacts. This threshold is consistent with the thresholds used by the U.S. EPA and others.

Using Dun and Bradstreet financial data from 2000 to 2002, staff calculated the ROEs, before and after the subtraction of the adjusted annual costs, for the selected businesses from each category. These calculations were based on the following assumptions.

- All affected businesses are subject to federal and state tax rates of 35 percent and 9.3 percent, respectively.

- Affected businesses neither increase the prices of their products nor lower their costs of doing business through cost-cutting measures because of the proposed ATCM.

These assumptions, though reasonable, might not be applicable to all affected businesses.

California businesses are affected by the annual cost of the proposed ATCM to the extent that the implementation of the proposed ATCM reduces their profitability. Using ROE to measure profitability, we found that the change in ROE for selected businesses from all categories range from negligible to a decline of about 7 percent in 2006. The average decline over all categories is less than 3 percent. This represents a small decline in the average profitability of the affected businesses. Overall, most affected businesses will be able to absorb the costs of the proposed ATCM with no significant impact on their profitability.

Potential Impact on Business Competitiveness

The proposed ATCM may affect the ability of some California businesses to compete with businesses outside the State due to the cost to satisfy the requirements of the proposed ATCM. Only businesses competing against products imported into the State may be affected. Most businesses use portable engines to perform maintenance, provide capability for emergency response, provide power in locations where grid power is not available, or render a service. The affected businesses provide a service as opposed to producing a product. Consequently, staff expects the ATCM to minimally impact the ability of California's businesses to compete with businesses outside the State.

In addition, the proposed ATCM would require businesses outside the State, if the companies wish to operate portable diesel-fueled engines in California, to satisfy the same requirements as California businesses.

Potential Impact on Employment, Business Competitiveness, Elimination or Expansion

The proposed ATCM applies to, and uses technology from, existing businesses, but may create new or expand business. Businesses that manufacture, sell, install, repair, or perform maintenance on diesel particulate emission control systems or diesel-fueled engines may experience an increase in demand for their products or services, resulting in an expansion of those businesses or the creation of new businesses.

ARB staff believes jobs will not be eliminated as a result of the proposed ATCM, but may lead to the augmentation or alteration of job duties, leading to no net result change in the number of jobs. Staff believes additional training may be required for these additional duties. Staff expects jobs will be created to install, repair, or perform maintenance on particulate filters and diesel-fueled engines.

F. Potential Costs to Local and State Agencies

In this section, we estimate the total costs to governmental agencies. The analysis also estimates the total fiscal costs to local and state agencies. Table VIII-4 shows two economic assessments. As discussed above, the most applicable assessment is determining the economic impact due to the early replacement of portable diesel-fueled engines owned by public agencies. Based on this methodology, the ARB staff estimates the total costs to public agencies to be approximately $62 to $79 million. Additionally, staff has also estimated the capital outlay necessary for public agencies to satisfy the requirements of the proposed ATCM. For this analysis, the capital costs were amortized over a 10-year period at a 5 percent real interest rate. Information for the engine populations were based in part on the results of an ARB survey sent to public agencies and on information from PERP. This type of analysis does not consider that public agencies may have budgeted funding to replace engines at the end of their useful life.

Table VIII-4: Summary of Annualized Costs for Pubic Agency Compliance with the Proposed ATCM (Millions of Dollars)

Category	Economic Impact Based on Useful Life Approach	Total Fiscal Impact	Fiscal Impact on an Annual Basis
Federal	$1.0-1.3	$2-2.9	$0.03-0.25
State	$4.4-5.6	$6.9-11.1	$0.1-1.0
City	$30-38	$55-79	$1-10
County	$5.5-7.1	$10-14.2	$0.2-1.7
Other Local	$21-27	$38-55	$0.7-6.5

Local Public Agencies

The majority of local governments use diesel-fueled portable engines in emergency applications, for maintenance, and to operate equipment at landfills. Emergency applications are one of the most common uses of portable engines by local governments. These applications include providing power for public safety purposes or to prevent flooding. Another major area of portable engine use is maintenance activities. Example of some of these activities includes road maintenance or tree trimming. Finally, diesel-fueled engines are often used in specialized equipment at landfills. Staff estimates that there are about 5,900 diesel-fueled portable engines used in these activities at the local level. The cost for complying with the proposed ATCM, based upon the value lost due to early replacement of engines and the addition of retrofit technology, is estimated to be $56 to $72 million. Actual capital outlay will total $102 to $147 million, the majority of which would be spent from 2008 through 2029. Annual outlay of capitol will vary between $2 to $13 million for all affected public agencies. Maintenance and recordkeeping costs can be as much as $1.8 million annually, although these costs will not be realized until after 2010.

Because the initial requirements of the proposed ATCM become effective January 1, 2010, there will be no initial fiscal impact on local agencies. Staff expects most agencies to modify their fleets during FY2008-2009 and FY2009-2010. To meet the 2010 requirement, staff estimates that on average, a fleet operator will need to replace about 50 percent of the fleet's engines. Based on this estimate, compliance cost for the fiscal years leading up to January 1, 2010 will be between $57 million and $93 million, or $7 to $11 million annually. We note that some public agencies have registered equipment with PERP, and therefore are subject to replacing their engines with an engine certified to an off-road engine emission standard by January 1, 2010. These engines are not included in the economic impact analysis of the ATCM.

Additionally, portable engines that are used exclusively in emergency applications or are designated low-use would not be subject to additional requirements (e.g., install retrofit technologies) until January 1, 2020. Staff estimates that about 65 percent of portable diesel-fueled engines used by local public agencies would be able to take advantage of these provisions. Owners that take advantage of these provisions will be required to maintain annual records for each engine designated as emergency or low-use. Cost of this recordkeeping should not exceed $200 a year for most public fleets.

Fiscal Effect on State Government

Several state agencies use portable diesel-fueled engines, including the Department of Transportation, the University of California and State College education systems, and the state prison system. The Department of

Transportation uses a variety of portable equipment to maintain California's highway and bridge system. Other state departments use portable engines for either emergency applications or maintenance purposes. Staff estimates that 650 engines may be impacted at the State government level by this proposed regulation. The cost for complying with the proposed ATCM, based upon the value lost due to early replacement of engines and the addition of retrofit technology is estimated to be $4.4 to $5.6 million. Actual capital outlay will total $7 to $11 million, the majority of which would be spent from 2008 through 2028. Annual outlay of capital will vary between $0.1 to $1 million for all affected state agencies. Maintenance and recordkeeping costs can be as much as $200,000 annually, although these costs will not be realized until after 2010.

Similarly, because the initial requirements of the proposed ATCM become effective January 1, 2010, there will be no initial fiscal impact. To meet the 2010 requirement, staff estimates that on average, a fleet operator will need to replace about 80 percent of the fleet's engines, and that these replacements will occur during FY2008-2009 and FY2009-2010 for most state agencies. Based on this estimate, compliance cost for the above fiscal years leading up to January 1, 2010 will be between $3.7 and 6.0 million, or $0.5 million to $0.7 million annually. We note that some public agencies have registered equipment with the PERP, and therefore are subject to replacing their engines with engines certified to off-road engine emission standards by January 1, 2010. These engines are not included in the economic impact analysis of the ATCM.

Fiscal Impacts on Federal Agencies

Military bases are the major federal users of portable diesel-fueled engines. Similar to other government entities, the military use portable engines for either emergency applications or maintenance purposes. Staff estimates that 150 federally-owned engines may be impacted by this proposed regulation. The cost for complying with the proposed ATCM, based upon the value lost due to early replacement of engines and the addition of retrofit technology, is estimated to be about $1 to $1.3 million. Actual capital outlay will total $2 to $2.9 million, the majority of which would be spent from 2008 through 2028. Annual outlay of capital will vary between $30,000 and $250,000 for all affected federal agencies. Maintenance and recordkeeping costs can be as much as $50,000 annually, although these costs will not be realized until after 2010.

Similarly, because the initial requirements of the proposed ATCM become effective January 1, 2010, there will be no initial fiscal impact. To meet the 2010 requirement, staff estimates that on average, a fleet operator will need to replace about 75 percent of the fleet's engines, and that these replacements will occur during FY2008-2009 and FY2009-2010. Based on this estimate, compliance cost for the fiscal years leading up to January 1, 2010 will be between $1.2 and 2.0 million, or $150,000 to $250,000 annually. We note that some public agencies have registered equipment with PERP, and therefore are subject to

replacing their engines with an engine certified to an off-road engine emission standard by January 1, 2010. These engines are not included in the economic impact analysis of the ATCM.

G. Summary of Total and Annual Costs for Compliance with the Proposed ATCM

Under this section, the total cost of the proposed ATCM to both private companies and governmental agencies is estimated. The total costs, based upon the value lost due to early replacement of engines, and annualized statewide costs are listed below in Table VIII-5. As discussed previously, the proposed ATCM provides a significant time period for the regulation to be fully implemented. The economic analysis reflects this by evaluating the impact of the proposed ATCM over a 30-year period. As shown in the table, the corresponding annualized costs will be much lower.

Table VIII-5: Summary of Total and Annualized Costs for Compliance with the Proposed ATCM (Millions of Dollars)

Category	Total Costs	Annualized Costs
Private	$290-$340	$2-$29
Federal	$1.0-$1.3	$0.03-$0.25
State	$4.4-$5.6	$0.1-$1.0
City	$30-$38	$1-$10
County	$5.5-$7.1	$0.2-$1.7
Other Local	$21-$27	$0.7-$6.5
Total	$350-$420	$4-$48

H. Cost-Effectiveness

In this section, the cost-effectiveness of the proposed ATCM is estimated. Cost effectiveness is expressed in terms of control costs (dollars) per air emissions reduced (pounds). As described below, for the proposed ATCM, the cost effectiveness is determined by dividing the total discounted capital costs plus the annual operation and maintenance costs by the annual pounds of diesel PM reduced. The discounted capital cost is based upon the value lost due to early replacement of engines plus the cost of retrofitting. As discussed earlier, staff estimates the proposed ATCM would result in a reduction of 11,000 tons of diesel PM emissions over the life of the ATCM. This reduction is based upon the additional reductions the ATCM achieves over the status quo. The status quo situation includes the reductions achieved through the current PERP. In addition, both the reductions and the anticipated costs of the proposed ATCM occur over a time period spanning 2005 to 2037.

The overall cost effectiveness of the proposed ATCM is $16 to $19 per pound diesel PM reduced. This estimate assumes all the costs of compliance are allocated to diesel PM reduction. Because the ATCM will also result in significant reductions in hydrocarbons and oxides of nitrogen emissions due to the early replacement of older engines with cleaner new engines, staff allocated half of the cost of compliance against these benefits, resulting in cost effectiveness values between $8/lb and $10/lb for diesel PM and less than $2/lb for NOx and ROG reduced. Based on this methodology, the proposed ATCM is also a cost-effective NOx measure.

Staff expects the overall cost effectiveness to improve over time, since the economic impact discussed above is based upon the technologies that are currently available today. As discussed previously, the major option available to reduce diesel PM emissions from portable diesel-fueled engines is replacing older diesel-fueled engines with new engines that emit less diesel PM. No control devices have been certified to Level-3 for off-road applications. The proposed ATCM allows a long lead-time for these technologies to be developed. As these technologies become available, staff expects the costs for the technologies to drop. For example, in the preamble for the proposed Tier 4 off-road engine standards, U.S. EPA staff estimated that diesel particulate traps will drop down to a cost of $15 per horsepower when on-road diesel-fueled vehicles are required to be equipped with diesel particulate traps beginning in 2007. In addition, staff expects many diesel-fueled portable engines that are used sparingly will not be replaced. Instead, staff expects occasional users of portable engines to rent the equipment as necessary.

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Appendix A

Proposed Regulation Order

Airborne Toxic Control Measure for Diesel Particulate Matter from Portable Engines Greater than 50 Horsepower

PROPOSED REGULATION ORDER

AIRBORNE TOXIC CONTROL MEASURE FOR DIESEL PARTICULATE MATTER FROM PORTABLE ENGINES GREATER THAN 50 HORSEPOWER

Adopt new Sections 93116, 93116.1, 93116.2, 93116.3, 93116.4, and 93116.5, Title 17, California Code of Regulations, to read as follows:

Airborne Toxic Control Measure For Diesel Particulate Matter From Portable Engines Greater Than 50 Horsepower

93116 PURPOSE

The purpose of this airborne toxic control measure (ATCM) is to reduce diesel particulate matter (PM) emissions from portable diesel-fueled engines having a rated brake horsepower greater than 50 (> 50 bhp).

Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39666, 41752, 43013 and 43018 Health and Safety Code. Reference: Sections 39650, 39666, 41752 Health and Safety Code.

93116.1 APPLICABILITY

(1) Except as provided below, all portable engines having a maximum rated capacity greater than 50 bhp and fueled with diesel are subject to this regulation.

(2) The following portable engines are not subject to this regulation:

(A) Any engine used to propel mobile equipment or a motor vehicle of any kind;

(B) Any portable engine using an alternative fuel;

(C) Dual-fuel diesel pilot engines that use an alternative fuel or an alternative diesel fuel;

(D) Tactical support equipment;

(E) Portable engines operated on either San Clemente or San Nicolas Island; and

(F) Ground support equipment at airports that satisfies the following requirements:

(1) the equipment is subject to an enforceable Memorandum of Understanding (MOU) with the local air district or Air Resources Board that regulates diesel PM emissions; and

(2) the Responsible Official has demonstrated to the satisfaction of the Executive Officer that the diesel PM reductions achieved by satisfying the requirements of the MOU is equivalent to the reductions achieved by satisfying 2020 fleet emission standards, section 93116.3(3)(A).

Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39666, 41752, 43013 and 43018 Health and Safety Code. Reference: Sections 39650, 39666, 41752 Health and Safety Code.

93116.2 DEFINITIONS

(1) **Air Pollution Control Officer or APCO** means the air pollution control officer of a district, or his/her delegate.

(2) **Alternative fuel** means gasoline, natural gas, propane, ethanol, or methanol.

(3) **Alternative Diesel Fuel** means any fuel used in a compression ignition (CI) engine that is not a reformulated CARB diesel fuel as defined in Title 13 CCR Sections 2281, 2282, and 2284 or an alternative fuel, and does not require engine or fuel system modifications for the engine to operate, although minor modifications (e.g., recalibration of the engine fuel control) may enhance performance. An emission control strategy using a fuel additive will be treated as an alternative diesel fuel based strategy unless:

(A) the additive is supplied to the engine fuel by an on-board dosing mechanism, or

(B) the additive is directly mixed into the base fuel inside the fuel tank of the engine, or

(C) the additive and base fuel are not mixed until engine fueling commences, and no more additive plus base fuel combination is mixed than required for a single fueling of a single engine.

(4) **CARB Diesel Fuel** means any diesel fuel that meets the specifications defined in *Title 13 CCR sections 2281, 2282, and 2284.*

(5) **Certified Nonroad Engine** refers to engines meeting an applicable nonroad engine emission standard as set forth in Title 13 of the California Code of Regulations or CFR 40 Part 89.

(6) **Diesel Particulate Matter (PM)** means the particles found in the exhaust of diesel-fueled CI engines which may agglomerate and adsorb other species to form structures of complex physical and chemical properties.

(7) **District** means a District as defined in Health and Safety Code section 39025.

(8) **Dual-fuel Diesel Pilot Engine** means a dual-fueled engine that uses diesel fuel as a pilot ignition source at an annual average ratio of less than 5 parts diesel fuel to 100 parts total fuel on an energy equivalent basis.

(9) **Emergency** refers to the use of a portable engine after the failure or loss of all or part of normal electrical power, normal natural gas supply, or mechanical work during any of the following events:

(A) the pumping of water or sewage to prevent or mitigate a flood or sewage overflow; or

(B) the pumping of water for fire suppression or protection.

where the failure of loss of electrical power or mechanical use is demonstrated to the satisfaction of the Executive Officer or the APCO, as appropriate, was beyond the reasonable control of the owner or operator of the portable engine.

(10) **Engine** means any piston driven internal combustion engine.

(11) **Executive Officer** means the Executive Officer of the California Air Resources Board or his / her designee.

(12) **Fleet** refers to a portable engine or group of portable engines that are owned and managed by an individual operational entity, such as a business, business unit within a corporation, or individual city or state department under the control of a Responsible Official. Engines that are owned by different business entities that are under the common control of only one Responsible Official shall be treated as a single fleet.

(13) **Fuel Additive** means any substance designed to be added to fuel or fuel systems or other engine-related systems such that it is present in-cylinder during combustion and has any of the following effects: decreased emissions, improved fuel economy, increased performance of the entire

vehicle or one of its component parts, or any combination thereof; or assists diesel emission control strategies in decreasing emissions, or improving fuel economy or increasing performance of a vehicle or component part, or any combination thereof. Fuel additives used in conjunction with diesel fuel may be treated as an alternative diesel fuel.

(14) In-Use Engine refers to portable diesel-fueled engines operating under valid permits or registrations as of December 31, 2005.

(15) Level-3 Verified Technology means a technology that has satisfied the requirements of the "Verification Procedure for In-Use Strategies to Control Emissions from Diesel Engines" in Title 13, California Code of Regulations, commencing with section 2700 and has demonstrated an reduction in diesel particulate matter of 85% or greater.

(16) Location means any single site at a building, structure, facility, or installation.

(17) Low-use Engines refers to portable diesel-fueled engines that operate 80 hours or less in a calendar year.

(18) Maximum Rated Horsepower (brake horsepower (bhp)) is the maximum brake horsepower rating specified by the portable engine manufacturer for continuous duty and listed on the nameplate of the portable engine.

(19) Nonroad Engine means:

(A) Except as discussed in paragraph (B) of this definition, a nonroad engine is any engine:

(1) in or on a piece of equipment that is self-propelled or serves a dual purpose by both propelling itself and performing another function (such as garden tractors, off-highway mobile cranes and bulldozers); or

(2) in or on a piece of equipment that is intended to be propelled while performing its function (such as lawnmowers and string trimmers); or

(3) that, by itself or in or on a piece of equipment, is portable or transportable, meaning designed to be and capable of being carried or moved from one location to another. Indicia of transportability include, but are not limited to, wheels, skids, carrying handles, dolly, trailer, or platform.

(B) An engine is not a nonroad engine if:

(1) the engine is used to propel a motor vehicle or a vehicle used solely for competition, or is subject to standards promulgated under section 202 of the federal Clean Air Act; or

(2) the engine is regulated by a federal New Source Performance Standard promulgated under section 111 of the federal Clean Air Act; or

(3) the engine otherwise included in paragraph (A)(3) of this definition remains or will remain at a location for more than 12 consecutive months or a shorter period of time for an engine located at a seasonal source. Any engine(s) that replace(s) an engine at a location and that is intended to perform the same or similar function as the engine replaced will be included in calculating the consecutive time period. An engine located at a seasonal source is an engine that remains at a seasonal source during the full annual operating period of the seasonal source. A seasonal source is a stationary source that remains in a single location on a permanent basis (at least two years) and that operates at that single location approximately three (or more) months each year.

(20) Off-Road Engine means the same as nonroad engine.

(21) Outer Continental Shelf (OCS) shall have the meaning provided by section 2 of the Outer Continental Shelf Lands Act (43 U.S.C. Section 1331 et seq.).

(22) Permit refers to a certificate issued by the Air Pollution Control Officer acknowledging expected compliance with the applicable requirements of the districts rules and regulations.

(23) Portable means designed and capable of being carried or moved from one location to another. Indicia of portability include, but are not limited to, wheels, skids, carrying handles, dolly, trailer, or platform. For the purposes of this regulation, dredge engines on a boat or barge are considered portable. The engine is not portable if:

(A) the engine or its replacement is attached to a foundation, or if not so attached, will reside at the same location for more than 12 consecutive months. Any engine such as back-up or stand-by engines, that replace engine(s) at a location, and is intended to perform the same or similar function as the engine(s) being replaced, will be included in calculating the consecutive time period. In that

case, the cumulative time of all engine(s) or, including the time between the removal of the original engine(s) and installation of the replacement engine(s), will be counted toward the consecutive time period; or

(B) the engine remains or will reside at a location for less than 12 consecutive months if the engine is located at a seasonal source and operates during the full annual operating period of the seasonal source, where a seasonal source is a stationary source that remains in a single location on a permanent basis (at least two years) and that operates at that single location at least three months each year; or

(C) the engine is moved from one location to another in an attempt to circumvent the portable residence time requirements.

[Note: The period during which the engine is maintained at a storage facility shall be excluded from the residency time determination.]

(24) **Project** means the use of one or more registered or permitted portable engines or equipment units operated at one location under the same or common ownership or control to perform a single activity.

(25) **Registration** refers to either:

(A) a certificate issued by the Executive Officer acknowledging expected compliance with the applicable requirements of the Statewide Portable Equipment Registration Program; or

(B) a certificate issued by the Air Pollution Control Officer acknowledging expected compliance with the applicable requirements of the district's Portable Equipment Registration Program.

(26) **Responsible Official** refers to an individual employed by the company or public agency with the authority to certify that the portable engines under his/her jurisdiction complies with applicable requirements of this regulation. A company or public agency may have more than one Responsible Official. A contracted designee cannot certify compliance in lieu of the Responsible Official.

(27) **School** means any public or private school used for purposes of the education of more than 12 children in kindergarten or any grade 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in private homes. The term includes any building or structure, playground, athletic field, or other area of school property. The term excludes unimproved school property.

(28) **Selective Catalytic Reduction (SCR) System** refers to an air pollution control system that utilizes a proprietary base metal catalyst designed to reduce emissions of oxides of nitrogen (NOx).

(29) **Stationary Source** means any building, structure, facility or installation that emits any affected pollutant directly or as a fugitive emission. Building, structure, facility, or installation includes all pollutant emitting activities which:

(A) are under the same ownership or operation, or which are owned or operated by entities which are under common control; and

(B) belong to the same industrial grouping either by virtue of falling within the same two-digit standard industrial classification code or by virtue of being part of a common industrial process, manufacturing process, or connected process involving a common raw material; and

(C) are located on one or more contiguous or adjacent properties.

[Note: For the purposes of this regulation a stationary source and nonroad engine are mutually exclusive.]

(30) **Storage** means a warehouse, enclosed yard, or other area established for the primary purpose of maintaining portable engines when not in operation.

(31) **Tactical Support Equipment (TSE)** means equipment using a portable engine, including turbines, that meets military specifications, owned by the U.S. Department of Defense and/or the U.S. military services or its allies, and used in combat, combat support, combat service support, tactical or relief operations, or training for such operations. Examples include, but are not limited to, engines associated with portable generators, aircraft start carts, heaters and lighting carts.

(32) **Tier 4 Emission Standards** refers to the final emission standards adopted by the U.S. EPA and CARB for newly manufactured nonroad engines designed to achieve the lowest diesel PM emissions.

(33) **Transportable** means the same as portable.

(34) **Verified Emission Control Strategy** refers to a diesel emission control strategy or system that has received approval from the Executive Officer according to the "Verification Procedure for In-Use Strategies to Control Emissions from Diesel Engines" in Title 13, California Code of Regulations, commencing with section 2700, and incorporated by reference.

(35) U.S. EPA refers to the United States Environmental Protection Agency.

Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39666, 41752, 43013 and 43018 Health and Safety Code. Reference: Sections 39650, 39666, 41752 Health and Safety Code.

93116.3 REQUIREMENTS

(1) Diesel-fueled portable engines shall use one of the following fuels:

(A) CARB diesel fuel; or

(B) alternative diesel fuel that has been verified through the Verification Procedure for In-Use Strategies to Control Emissions from Diesel Engines; or

(C) CARB diesel fuel utilizing fuel additives that have been verified through the Verification Procedure for In-Use Strategies to Control Emissions from Diesel Engines.

[Note that credit for diesel PM reductions for CARB diesel fuel blends that use biodiesel, Fischer Tropsch fuels, or emulsions of water in diesel fuel is available only for fuel blends that have satisfied the requirements of the Verification Procedure for In-Use Strategies to Control Emissions from Diesel Engines. The credit granted is based upon the verified level approved by the Executive Officer within the Executive Order for the fuel blend.]

(2) Diesel PM Standards

(A) Requirements for in-use engines

(1) Starting January 1, 2010, all portable diesel-fueled engines shall be certified to meet a federal or California standard for newly manufactured nonroad engines pursuant to 40 CFR Part 89 or Title 13 of the California Code of Regulations (that is, certified to Tier 1, 2 or 3 nonroad engine standards).

(2) In lieu of complying with the 2010 requirement, owners of engines used exclusively in emergency applications or engines that qualify as a low-use engines may commit to replacing these engines with Tier 4 engines, subject to the requirements in section 93116.3(2)(D) below.

(3) Starting January 1, 2013 all portable diesel-fueled engines are subject to section 93116.3(3).

(B) Portable diesel-fueled engines that have not been permitted or registered prior to January 1, 2006, are subject to the following requirements:

(1) the portable engine shall meet the most stringent federal or California emission standard for nonroad engines pursuant to 40 CFR Part 89 or Title 13 of the California Code of Regulations (that is, certified to Tier 3 nonroad engine standards or Tier 4 nonroad engine standards, once these engines are available); and

(2) a diesel-fueled portable engine used exclusively for emergency applications or low-use engine designation is subject to the requirements of section 93116.3(2)(C); and

(3) for new applications to permit or register engines after January 1, 2013, the portable engine is subject to section 93116.3(3).

(C) Except as provided in section 93116.3(2)(D), portable diesel-fueled engines used exclusively in emergency applications or qualifying as low-use engines shall satisfy one of the following requirements by January 1, 2020:

(1) the engine is certified to Tier 4 emission standards for newly manufactured nonroad engines; or

(2) the engine is equipped with a properly functioning level-3 verified technology ; or

(3) the engine is equipped with a combination of emission control systems or devices that have been verified together to achieve at least 85% reduction in diesel PM emissions.

(D) Owners that commit to replacing in-use engines with engines certified to the Tier 4 nonroad engine standards in lieu of satisfying the 2010 requirement shall:

(1) submit written notification identifying the specific engines to be replaced with engines certified to the Tier 4 emission standards; and

(2) for each class and category of nonroad engine, replace each engine so identified within two years of the first engine being offered for sale that satisfies the Tier 4 emission standards.

(3) Fleet Requirements

(A) Each fleet is subject to and shall comply with the following weighted PM emission fleet averages expressed as grams per brake horsepower-hour (g/bhp-hr) by the listed compliance dates:

Fleet Standard Compliance Date	Engines <175 hp (g/bhp-hr)	Engines ≥175 to 749 hp (g/bhp-hr)	Engines ≥750 hp (g/bhp-hr)
1/1/13	0.3	0.15	0.25
1/1/17	0.18	0.08	0.08
1/1/20	0.04	0.02	0.02

(B) For the purposes of this regulation, the portable diesel-fueled engines affected by the fleet provisions of this regulation include all portable diesel-fueled engines operated in California, including portable engines registered with the Statewide Portable Equipment Registration Program or permitted or registered with local districts. The California fleet will be further divided into engines rated at less than 175 horsepower, engines rated at 175 horsepower up to 749 horsepower, and engines that are 750 horsepower and larger. Each portion of the fleet would be subject to the above fleet emission standards.

(C) The following portable diesel-fueled engines shall be excluded from a fleet:

(1) Portable diesel-fueled engines operated exclusively outside of California or operated only within the OCS.

(2) Portable diesel-fueled engines used exclusively in emergency applications.

(3) Portable diesel-fueled engines that qualify as a low-use engines.

(D) Portable diesel-fueled engines that qualify as a low-use engine and subsequently exceed the allowed hours of operation in a calendar year or engines that are identified to be used exclusively in emergency applications, but subsequently are used in non-

emergency applications become immediately subject to the requirements of section 93116.3(3).

(E) Portable alternative fueled engines may be included in a fleet if the engine satisfies the requirements in section 93116.3(4)(B)(2).

(F) Diesel-fueled portable engines equipped with SCR systems.

(1) The diesel PM fleet emission standards in section 93116.3(3)(A) do not apply to:

(a) portable diesel-fueled engines equipped with properly operating SCR systems as of January 1, 2004; and

(b) with the approval of the Executive Officer, portable diesel-fueled engines equipped with properly operating SCR systems after January 1, 2004.

(2) At the request of the Responsible Official, portable diesel-fueled engine(s) equipped with a SCR system(s) may be included in the company's fleet for the purpose of complying with an applicable fleet emission standard. Once the engine(s) are included in a company's fleet, the company's compliance with applicable fleet emission standards shall always include these diesel-fueled portable engine(s) equipped with SCR system(s).

(3) For all diesel-fueled portable engines equipped with SCR systems, the following information shall be submitted to the Executive Officer to demonstrate that the SCR system is operating properly:

(a) tests results for NOx, PM, and ammonia slip

(1) the measurements shall be conducted with ARB or district approved test methods; and

(2) diesel PM shall be measured with ARB test method 5 or equivalent district approved test method. For the purposes of this requirement, only the probe catch and filter catch ("front half") is used to determine the emission rate, g/bhp-hr, and shall not include PM captured in the impinger catch or solvent extract; and

(3) the duration of the emission test shall be sufficient to document the typical operation of the engine(s); and

(4) testing shall be performed at the frequency required by the permit or registration. In no event shall the time between emission tests exceed three years.

(G) Beginning on January 1, 2013, the weighted average PM emission rate for the fleet cannot exceed the fleet standard that is in effect. Changes in the fleet, including engine additions and deletions, shall not result in noncompliance with this standard.

(4) Fleet Average Calculations

(A) General Provisions

(1) The average PM emission factor for the fleet is determined by the following formula:

$$\frac{\sum \text{Summation for each engine in the fleet (bhp x emission factor)}}{\sum \text{Summation for each engine in the fleet (bhp)}}$$

where:

bhp = horsepower at maximum rated capacity.

emission factor = diesel PM emission rate, as determined below:

(2) The following diesel PM emission rates shall be used with the above formula to determine the weighted average fleet emission rate:

(a) for diesel-fueled portable engines certified to a nonroad engine standard, the results of emission measurements submitted to either the U.S. EPA or CARB for the purposes of satisfying the appropriate emission standard; or

(b) results from emission measurements from a verification approved by the Executive Officer for an emission control system or strategy may be used in conjunction with engine emission information; or

(c) for diesel-fueled portable engine(s) equipped with SCR system(s), results from valid emission tests.

(B) The following incentives may be used to revise the fleet average, as outlined below:

(1) Where equipment uses grid power for more than 200 hours in lieu of operating a diesel engine for a given project, the time period grid power is used may be used to reduce each affected engine's emission factor. The emission factor for each affected engine will be reduced proportionally by the percentage of time the equipment uses grid power. To receive credit for grid power in the fleet calculation, the recordkeeping and reporting requirements in Section 93116.4(3)(C) shall be satisfied.

(2) Alternative fueled portable engines operating 100 or more hours may be included toward determining compliance with the applicable fleet emission standards. An diesel PM emission rate of zero shall be used in the fleet calculations for these engines.

(3) Tier 4 engines added to a fleet prior to January 1st, 2015 may be counted twice in the company's fleet average determination toward compliance with the 2013 and 2017 fleet emission standards.

Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39666, 41752, 43013 and 43018 Health and Safety Code. Reference: Sections 39650, 39666, 41752 Health and Safety Code.

93116.4 FLEET RECORDKEEPING AND REPORTING REQUIREMENTS

(1) The owner or operator of a fleet is not subject to the requirements of this section if <u>all</u> portable diesel-fueled engines in the fleet satisfy any one of the following requirements:

(A) the engine is certified to Tier 4 emission standards for newly manufactured nonroad engines; or

(B) the engine is equipped with a properly functioning level-3 verified emission control system; or

(C) the engine is equipped with a combination of emission control systems or devices that have been verified together to achieve at least 85% reduction in diesel PM emissions.

(2) Diesel-fueled portable engine(s) equipped with properly operating SCR system(s) shall be excluded from the requirements of 93116.4(1), if the engine(s) is not subject to section 93116.3(3)(A).

(3) Effective January 1, 2012, the Responsible Official of a fleet shall:

(A) Keep and maintain records for:

(1) alternative-fueled portable engines used as part of a company's fleet average;

(2) engines affected by the use of electrification;

(3) low-use engines; and

(4) engines used exclusively in emergency applications.

(B) the Responsible Official, for all engines subject to section 93116.4(3)(A), shall:

(1) Install or caused to be installed and properly maintain on each portable engine subject to recordkeeping a non-resettable hour-meter; and

(2) Maintain on a calendar year basis a record of the total hours of operation for each portable engine. If the portable engine is used out-of-state, then the records may account for operation within California only, excluding operation within the OCS; and

(3) Maintain all required records at a central place of business for five years. The records shall clearly identify each engine subject to the recordkeeping requirement as well as the annual hours of operation. These records are to be made available, upon request for inspection, to local air pollution control district or CARB personnel. The requested records shall be provided to the appropriate personnel within three business days of the request.

(C) The Responsible Official of a fleet electing to use electrification in determining the fleet average shall:

(1) notify the Executive Officer identifying the dates, location, duration of the project, and a description of the project that will rely on electrification instead of using diesel engines. The notification shall be provided prior to the start of the project; and

(2) identify each affected engine, including: make, model, serial number, year of manufacture for each engine, emission factor (g/bhp-hr) and district permit or State registration number; and

(3) shall clearly identify the electrification activity, including indicating the amount of electricity used and the time period for the project; and

(4) shall retain copies of contracts or other documentation, with the project proponent and/or applicable utility, supporting the use of grid power.

(D) Test results for SCR compliance shall be maintained at a central place of business for five years. At the request of ARB or district personnel, the Responsible Official shall have 3 business days to provide a copy of the most recent test results.

(4) The Responsible Official of the fleet shall provide the following reports as identified below to the Executive Officer:

(A) A status report, due to the Executive Officer by March 1, 2011, that includes the following items:

(1) the fleet's weighted average PM emission rate for the 2010 calendar year, including a summary for each engine that is part of the fleet and each engine's emission rate (g/bhp-hr); and

(2) inventory of portable engines in the fleet identifying whether the engine is state-registered or permitted with the district. Alternative-fueled engines should be identified by fuel type. The inventory shall identify the make, model, serial number, year of manufacture, and primary fuel type for each engine, emission factor (g/bhp-hr), and district permit or State registration number for each engine to be used in the fleet average determination; and

(3) identify, if applicable, each engine that the owner commits to replacing with a Tier 4 engine, including: make, model, serial number, year of manufacture for each engine, and district permit or State registration number; and

(4) listing of engines, if applicable, used exclusively in emergency applications. The listing shall identify each engine claiming use only in emergency applications, including: make, model, serial number, year of manufacture for each engine, emission factor (g/bhp-hr), and district permit or State registration number; and

(5) listing of engines, if applicable, satisfying the low use engine requirements. The listing shall identify each engine, including: make, model, serial number, year of manufacture for each engine, emission factor (g/bhp-hr), and district permit or State registration number; and

(6) for engine(s) equipped with SCR(s), documentation demonstrating that the SCR system is operating properly.

(B) A statement of compliance signed by the Responsible Official that the fleet standards are being achieved and a summary that identifies each portable engine in the fleet and the associated emission rate (g/bhp-hr). Engines included in the fleet are those that are part of the fleet at the time the fleet standard became effective. The engine identification shall include, at a minimum, the make, model, serial number, and year of manufacture for each engine. Alternative-fueled engines should be identified by fuel type. The statements of compliance are due to the Executive Officer by the following dates:

(1) March 1, 2013 for the fleet standards that become effective January 1, 2013; and

(2) March 1, 2017 for the fleet standards that become effective January 1, 2017; and

(3) March 1, 2020 for the fleet standards that become effective January 1, 2020.

(C) The Responsible Official shall identify to the Executive Officer, as part of each compliance report, the specific engines, if any, used exclusively in emergency applications and the specific engines, if any, claimed to be low use engines. The list shall include for each engine: the make, model, serial number, year of manufacture for each engine, emission factor (g/bhp-hr), and district permit or State registration number.

(D) The Responsible Official shall identify to the Executive Officer, as part of each compliance report, the specific engines, if any, excluded from the fleet because the engine operated exclusively outside of California or operated only within the OCS. The list shall include for each engine: the make, model, serial number, year of manufacture, and, district permit or State registration number for each engine.

(E) If compliance with the fleet average includes the use of electrification, then the Responsible Official shall provide documentation supporting the credit claimed for electrification.

(F) As part of each compliance report, the Responsible Official shall, if applicable, certify the following:

(1) All alternative fueled engines included in the fleet average operated at least 100 hours during the previous 12 months prior to the fleet emission standard becoming effective.

(2) For all engines using the emergency designation, the engines were used only for emergency applications.

(3) For all engines using the low-use designation, the engines operated no more than 80 hours for the reporting period.

(4) For all engines equipped with SCR, the engine complies with applicable district or Statewide Portable Equipment Registration Program requirements.

(G) After March 1, 2013, the APCO or the Executive Officer can require the submittal of information demonstrating compliance with the applicable fleet standard. Upon receiving the request, the Responsible Official shall provide the requested information within 30 days.

Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39666, 41752, 43013 and 43018 Health and Safety Code. Reference: Sections 39650, 39666, 41752 Health and Safety Code.

93116.5 ENFORCEMENT OF FLEET REQUIREMENTS

(1) Both the Executive Officer and the APCO have the authority to review or seek enforcement action for violation of the fleet emission standard.

(2) The ARB will make available to the districts the information the Responsible Official has provided to ARB to demonstrate compliance with the fleet standard.

Authority cited: Sections 39600, 39601, 39650, 39658, 39659, 39666, 41752, 43013 and 43018 Health and Safety Code. Reference: Sections 39650, 39666, 41752 Health and Safety Code.

Appendix B

Public Agency Survey

Public Agency Survey

Background

In an effort to better assess the use of portable diesel-fueled engines by local public agencies, ARB surveyed public agencies, requesting information on the use of the engines, characteristics of the engines (make and model, year of manufacture, and manufacturers rated horsepower), and annual hours of operation. The public agencies surveyed included city and county public works departments, city and county water suppliers, publicly owned treatment facilities, public landfills, universities and colleges, prisons, and other miscellaneous state and local agencies. The ARB staff mailed out over 1,000 surveys in the spring of 2002, and about 15 percent of the public agencies responded. A copy of the survey is attached to this Appendix.

Additional information on portable engines used by public agencies is available from engines registered by public agencies and from a separate survey administered by a consultant under contract with the ARB's Mobile Source Control Division. Information for these engines is included, as appropriate, as part of the survey results discussed below.

Overall, information for about 1,500 portable diesel-fueled engines operated by public agencies was gathered, representing an estimated 25 percent of the total engines used by public agencies.

Survey Results

The following summarizes the results of the survey:

- Portable engines used by public agencies are typically less than 150 horsepower—very few engines are larger than 500 horsepower;
- Most common applications are compressors, generators, water pumps, and wood chippers—representing 75 percent of the applications;
- Most of the pumps and generators, about 70 percent, are operated less than 50 hours per year and about half of the compressors are operated less than 50 hours per year. Overall, about 65 percent of the engines operated by public agencies operate less than 50 hours per year; and
- About 50 percent of the portable diesel-fueled engines used by cities and county public agencies are certified engines, and 25 percent of the portable diesel-fueled engines used by State and federal public agencies are certified engines.

Winston H. Hickox
Agency Secretary

Air Resources Board

Alan C. Lloyd, Ph.D.
Chairman
1001 I Street • P.O. Box 2815 • Sacramento, California 95812 • www.arb.ca.gov

Gray Davis
Governor

March 27, 2002

Dear Sir or Madam:

The California Air Resources Board (ARB) is in the process of developing regulatory measures to reduce particulate matter emissions from diesel-fueled engines, in this case, portable engines. To support this effort, ARB staff is gathering information on the type and operation characteristics of portable diesel-fueled engines owned and operated by state/local governments or municipalities. Staff is also identifying candidate equipment for emissions testing purposes. The test results will be used to help evaluate the feasibility of emission controls for portable diesel-fueled engines.

Portable diesel-fueled engines are engines that perform work but do not remain in one location for more than 12 months. For example, portable diesel-fueled engines include portable electrical generators, pumps and compressors. Portable engines do not include engines that provide power to propel the equipment or vehicles from location to location.

If your agency owns or operates portable equipment powered by diesel-fired engines, we are requesting that you provide some basic information on the equipment, type of engine, and operation frequency.

We would appreciate you taking time to complete the survey on the backside of this letter. When completed, tri-fold and staple the letter, so that the ARB address shows up on the outside. Please return the completed survey by May 1, 2002.

If you have any questions, please contact Mr. Glen Villa of my staff at (916) 322-6456 or by e-mail at gvilla@arb.ca.gov. Thank you for your cooperation.

Sincerely,

Michael Tollstrup, Chief
Project Assessment Branch
Stationary Source Division

----------Fold Here----------

Place
Stamp
Here

California Air Resources Board
Stationary Source Division
Attn: Glen Villa
P.O. Box 2815
Sacramento, CA 95812

Survey of Portable Diesel-Fueled Engines Owned by State / Local Governments or Municipalities

1. List the application(s) of portable diesel-fueled engines at your facility. Application-Use of engine. I.e. pump, compressor, generator. Model Year (MY)-date of manufacture. Horsepower (HP)-manufacturers rated HP. Hrs/yr-How many hours did the engine operate 1/1/01 to1/1/02? See example. (Please make additional copies if needed)

Application Pump Make/Model John Deere 4045DF150 MY 01 HP 106 Hrs/yr 1000

Application _____ Make/Model _____ MY ____ HP ____ Hrs/yr ____

Application _____ Make/Model _____ MY ____ HP ____ Hrs/yr ____

Application _____ Make/Model _____ MY ____ HP ____ Hrs/yr ____

Application _____ Make/Model _____ MY ____ HP ____ Hrs/yr ____

Application _____ Make/Model _____ MY ____ HP ____ Hrs/yr ____

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Application _____ Make/Model _____ MY ____ HP ____ Hrs/yr ____

Application _____ Make/Model _____ MY ____ HP ____ Hrs/yr ____

Application _____ Make/Model _____ MY ____ HP ____ Hrs/yr ____

Application _____ Make/Model _____ MY ____ HP ____ Hrs/yr ____

2. Who should we contact if we have additional questions regarding the survey?

Contact Name:_____

Facility Name: _____

Address: _____

Phone Number:_____ Fax Number: _____

E-mail address:_____

Please add me to ARB's mailing list for diesel particulate matter regulatory development activities?

Yes No (Circle One)

Appendix C

Off-Road Compression-Ignition Engine Standards

TABLE 1
Off-Road Compression-Ignition Engine Standards
NMHC+NOx/CO/PM in g/hp-hr (g/kW-hr)
Standards Include an Emissions Durability Period[c,d,e]

hp (kw)	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
<11 (8)[f]	See Table 2					7.8 (10.5) 6.0 (8.0) 0.75 (1.0)					5.6 (7.5) 6.0 (8.0) 0.60 (0.80)			
≥11 (8) <25 (19)[f]	See Table 2					7.1 (9.5) 4.9 (6.6) 0.60 (0.80)					5.6 (7.5) 4.9 (6.6) 0.60 (0.80)			
≥25 (19) <50 (37)[f]					7.1 (9.5) 4.1 (5.5) 0.60 (0.80)					5.6 (7.5) 4.1 (5.5) 0.45 (0.60)				
≥50 (37) <100 (75)[f]				N/A[a] 6.9 (9.2) N/A N/A						5.6 (7.5) 3.7 (5.0) 0.30 (0.40)				3.5 (4.7) 3.7 (5.0) (b)
≥100 (75) <175 (130)[f]			N/A[a] 6.9 (9.2) N/A N/A						4.9 (6.6) 3.7 (5.0) 0.22 (0.30)				3.0 (4.0) 3.7 (5.0) (b)	
≥175 (130) <300 (225)[f]		1.0 (1.3)[a] 6.9 (9.2) 8.5 (11.4) 0.40 (0.54)							4.9 (6.6) 2.6 (3.5) 0.15 (0.20)			3.0 (4.0) 2.6 (3.5) (b)		
≥300 (225) <600 (450)[f]		1.0 (1.3)[a] 6.9 (9.2) 8.5 (11.4) 0.40 (0.54)					4.8 (6.4) 2.6 (3.5) 0.15 (0.20)					3.0 (4.0)[g] 2.6 (3.5) (b)		
≥600 (450) <750 (560)[f]		1.0 (1.3)[a] 6.9 (9.2) 8.5 (11.4) 0.40 (0.54)						4.8 (6.4) 2.6 (3.5) 0.15 (0.20)				3.0 (4.0)[g] 2.6 (3.5) (b)		
≥750 (560)[f]						1.0 (1.3)[a] 6.9 (9.2) 8.5 (11.4) 0.40 (0.54)						4.8 (6.4) 2.6 (3.5) 0.15 (0.20)		

(a) Standards given are HC/NOx/CO/PM in g/hp-hr (g/kW-hr).
(b) PM standards have not been specified.
(c) For all engines rated under 19 kW, and for constant speed engines rated under 37 kW with rated speeds greater than or equal to 3,000 rpm, the durability period and useful life is a period of 3,000 hours or five years of use, whichever first occurs.
(d) For all other engines rated at or above 19 kW and under 37 kW, the durability period and useful life is a period of 5,000 hours or seven years of use, whichever first occurs.
(e) For all engines rated at or above 37 kW, the durability period and useful life is a period of 8,000 hours of operation or ten years of use, whichever first occurs.
(f) Prior to the year 2000, these engines were classified as small off-road engines. Refer to the small off-road engine standards for model years prior to 2000.
(g) Manufacturers have agreed to comply with these standards by 2005.

Appendix D

Summary of District Rules that Apply to Portable Engines

District Regulations Affecting Portable Engines

District	Emission Rates	Day/Annual Caps
Antelope Valley	1) Engines >50HP but <117 HP shall not exceed NOx emissions of 10.5 g/hp-hr or be installed with a turbocharger and timing retarded by a min. of 4 degrees from the manufacturer's standard timing; 2) engines >117 HP but <400 HP shall not exceed NOx emissions of 10 g/hp-hr or be installed with a turbocharger and timing retarded by a min. of 4 degrees from the manufacturer's standard timing; 3) engines ≥ 400 HP shall not exceed NOx emissions of 7 g/hp-hr or be installed with a turbocharger with aftercooler and timing retarded by a minimum of 4 degrees from the manufacturer's standard timing; and 4) emission from sulfur shall not exceed 0.05 percent by weight; 5) emission from PM shall not exceed 0.10 grain per standard dry cubic feet. [Rule 2100]	1) NOx or VOC emissions shall not exceed 100 pounds per day for each pollutant, excluding emissions from offroad engines; 2) total PM10 emissions shall not exceed 150 pounds per day, excluding emissions from offroad engines; and 3) emissions shall not exceed 10 tons per year of any affected pollutant when operated in any participating district. [Rule 2100]
	1) Engines > 100 bhp and < 117 bhp shall not exceed 770 ppm of NOx; 2) engines > 117 bhp and < 400 bhp shall not exceed 550 ppm of NOx; and 3) engines ≥ 400 bhp shall not exceed 535 ppm of NOx. [Rule 1110.2]	
BAAQMD	Not Applicable	Equipment shall not emit no more than 10 tons/yr of each pollutant, including POC, CO, NOx, PM10, NPOC or SO2. [Rule 2-1-220]
Mojave Desert	For diesel-cycle engines rated at 500 HP or more and operate more than 100 hours each calendar year, NOx emissions shall not exceed 700 ppmv and CO emission standards shall not exceed 4500 ppmv. [Rule 1160]	Not Applicable

District	Emission Rates	Day/Annual Caps
Northern Sierra	1) NOx emissions from naturally aspirated engines shall not exceed 10 g/bhp-hr; 2) NOx emissions from turbocharged engines shall not exceed 7.2 g/bhp-hr; 3) emission from sulfur shall not exceed 0.05 percent by weight; and 4) emission from PM shall not exceed 0.10 grain per standard dry cubic feet. [Rule 523]	1) Except for emissions from existing emissions units, NOx or VOC emissions shall not exceed 100 lbs/day for each pollutant; 2) except for emissions from existing emissions units, total PM10 emissions shall not exceed 150 lbs/ day; and 3) emissions shall not exceed 10 tons per year of any affected pollutant when operated in any participating district. [Rule 523]
San Diego	1) NOx emissions from naturally aspirated engines shall not exceed 10 g/bhp-hr; 2) NOx emissions from turbocharged engines shall not exceed 7.2 g/bhp-hr; 3) emission from sulfur shall not exceed 0.05 percent by weight; and 4) emission from PM shall not exceed 0.10 grain per standard dry cubic feet. [Rule 12.1 & 20.4]	1) Except for emissions from existing emissions units, NOx or VOC emissions shall not exceed 100 lbs./ day for each pollutant; 2) except for emissions from existing emissions units, total PM10 emissions shall not exceed 150 lbs./ day; and 3) emissions shall not exceed 10 tons per year of any affected pollutant when operated in any participating district. [Rule 12.1]
San Joaquin Valley Unified	1) NOx emissions from naturally aspirated engines shall not exceed 10 g/bhp-hr; 2) NOx emissions from turbocharged engines shall not exceed 7.2 g/bhp-hr; 3) emission from sulfur shall not exceed 0.05 percent by weight; 4) emission from PM shall not exceed 0.10 grain per standard dry cubic feet. [Rule 2280]	1) Except for emissions from existing emissions units, NOx or VOC emissions shall not exceed 100 lbs./ day for each pollutant; 2) except for emissions from existing emissions units, total PM10 emissions shall not exceed 150 lbs./ day; and 3) emissions shall not exceed 10 tons per year of any affected pollutant when operated in any Participating District. [Rule 2280]

District	Emission Rates	Day/Annual Caps
San Luis Obispo	1) NOx emissions from naturally aspirated engines shall not exceed 10 g/bhp-hr; 2) NOx emissions from turbocharged engines shall not exceed 7.2 g/bhp-hr; 3) emission from sulfur shall not exceed 0.05 percent by weight; and 4) emission from PM shall not exceed 0.10 grain per standard dry cubic feet. [Rule 220]	1) NOx or VOC emissions shall not exceed 100 lbs/ day for each pollutant; 2) total PM10 emissions shall not exceed 150 lbs/ day; and 3) emissions shall not exceed 10 tons per year of any affected pollutant when operated in any Participating District. [Rule 220]
SCAQMD	By January 1, 1999, the following apply: 1) Engines >50HP but <117 HP shall not exceed NOx emissions of 10 g/hp-hr or be installed with a turbocharger and timing retarded by a min. of 4 degrees from the manufacturer's standard timing; 2) engines >117 HP but <400 HP shall not exceed NOx emissions of 7.2 g/hp-hr or be installed with a turbocharger and timing retarded by a min. of 4 degrees from the manufacturer's standard timing; and 3) Engines > 400 HP shall not exceed NOx emissions of 7 g/hp-hr or be installed with a turbocharger with aftercooler and timing retarded by a minimum of 4 degrees from the manufacturer's standard timing. By January 1, 2010, portable engines must meet the most stringent emissions standard which is the applicable emissions standard in effect and set forth in Title 13 of the California Code of Regulations for that engine rating. [Rule 1110-2]	Not Applicable
Ventura	All drilling operations shall be powered by grid power unless exempted by Section C of this rule. [Rule 74.16]	Not Applicable
Yolo-Solano	1) NOx emissions from naturally aspirated engines shall not exceed 10 g/bhp-hr; 2) NOx emissions from turbocharged engines shall not exceed 7.2 g/bhp-hr; 3) emission from sulfur shall not exceed 0.05 percent by weight; and 4) emission from PM shall not exceed 0.10 grain per standard dry cubic feet. [Rule 3.3]	1) NOx or VOC emissions shall not exceed 100 lbs/ day for each pollutant; 2) total PM10 emissions shall not exceed 150 lbs/ day; and 3) emissions shall not exceed 10 tons per year of any affected pollutant when operated in any participating district. [Rule 3.3]

Appendix E

Portable Diesel Engine Emission Control Technology

Portable Diesel Engine Emission Control Technologies

In this appendix to the staff report, the ARB staff provides descriptions of PM reduction emission control strategies currently available and projected to be available in the near future. Additional information on the wide variety of emission reduction options for diesel fueled engines is provided in the Diesel Risk Reduction Plan.

There are many types of control technologies available to control diesel particulate matter from portable diesel engines, such as diesel oxidation catalysts, diesel particulate filters, fuel additives and alternative diesel fuels. While most of these technologies are currently being verified by the ARB for on-road vehicles, there are some that may be verified for portable diesel engines. Currently, the diesel oxidation catalyst from Donaldson is the only control technology that has been verified for off-road engine use.

Verification of Diesel Emission Control Devices

In March 2002, the Board adopted the *Verification Procedure, Warranty and In-Use Compliance Requirements of In-Use Strategies to Control Emissions from Diesel Engines* (Verification Procedure) in support of the ARB's regulatory efforts to reduce diesel PM. The Verification Procedure establishes a process through which manufacturers of emission control equipment can demonstrate and verify the emission reduction capabilities of control technologies. Examples of emission control technologies that can be considered for verification include: diesel particulate filters, diesel oxidation catalysts, exhaust gas recirculation, selective catalytic reduction systems, fuel additives and alternative diesel fuel systems. The Verification Procedure is voluntary and applies to emission control technologies for on-road, off-road and stationary applications. A brief discussion on the Verification Procedure is provided below.

The Verification Procedure requires emission control strategy applicants to establish the emissions reduction capabilities for an emission control device, conduct a durability demonstration, conduct a field demonstration and submit results with additional information in a prescribed-format application to the ARB. The applicant verifies the product for a specific engine manufacturer, years produced, engine family and series. If after reviewing the application the ARB verifies the diesel emission control strategy, it will issue an Executive Order to the applicant stating the verified emission reduction and any conditions that must be met for the diesel emission control strategy to function properly. The Verification Procedure also requires that the applicants provide a warranty to the end-user and conduct in-use compliance testing.

The results of the Verification Procedure testing determine the control technology classification. The multi-level verification system consists of three PM reduction levels. The Verification Procedure also has provisions for verifying strategies that

reduce oxides of nitrogen (NOx) emissions. Control device verifications for both PM and NOx are classified by level as listed in Table 1.

Table 1: Verification Classifications for Diesel Emission Control Strategies

Pollutant	Reduction	Classification
PM	< 25%	Not Verified
	≥ 25%	Level 1
	≥ 50 %	Level 2
	≥ 85% or ≤0.01 g/bhp-hr	Level 3
NOx	< 15%	Not Verified
	≥ 15%	Verified in 5% increments

Once a device has been verified, the executive order and accompanying information is posted on the ARB's web site at http://www.arb.ca.gov/diesel/verifieddevices/verdev.htm.

Diesel Oxidation Catalyst

Diesel oxidation catalyst (DOC) reduces the emissions of particulate matter (PM), carbon monoxide (CO) and gaseous reactive organic gas (ROG) from diesel engines by catalytic oxidation. The technology is only effective on the soluble organic faction of diesel PM, and therefore the overall reduction that can be achieved by a DOC is limited—the range of reduction is typically between 10 to 30 percent (Khair, 1999).

For off-road applications, the only DOC that is verified to date is the Donaldson DCM diesel oxidation catalyst muffler with 6000 series catalyst formulation plus a closed loop crankcase with the Donaldson Spiracle™ closed crankcase filtration system. This system requires the use of California Diesel fuel. The system is a Level 1, which controls diesel PM to an average of 25 percent. This system may be used in four-stroke, turbocharged diesel engines ranging from 150 horsepower (hp) to 600 hp.

Diesel Particulate filters

Diesel particulate filters (DPF) reduce diesel PM emissions through filtration. This technology is very efficient in controlling diesel PM emissions, and has been demonstrated to reduce diesel PM by over 90 percent. DPF can be categorized into several classifications: passive, active, or flow-through.

Passive DPFs use a catalytic material that allows the trapped PM to be burned-off or oxidized at a lower temperature. For the system to be successful, the engine must be operated such that the exhaust maintains a minimum temperature for a certain period of time. Otherwise, diesel PM will accumulate in the filter, eventually causing operating problems. Several passive DPFs have been verified for on-road

applications. To date no DPFs have been verified for portable engines. The duty cycle for equipment must be such that the engine exhaust temperature and its duration is above the manufacturer's specifications. If temperatures are below the DPF's manufacturer's specifications, soot accumulates in the filter, increasing exhaust backpressure resulting in engine damage. Each engine should be tested to see if its duty cycle would accommodate a passive DPF.

An active DPF performs the same function as a passive DPF. The difference is that the active DPF does not use heat from the engine exhaust to oxidize the trapped PM. An active DPF is better suited for low exhaust temperatures or engines with high PM emissions. Most common methods use electrical regeneration by passing an electrical current through the filter medium, injecting fuel to provide additional heat to oxidize the trapped PM, or adding fuel-borne catalyst or other reagents to initiate regeneration. Some DPFs induce regeneration automatically on-board the vehicle or equipment when a specified back pressure is reached. Others use an indicator, such as a warning light, to alert the operator that regeneration is needed, requiring the operator to initiate the regeneration process. A number of filters are removed and regenerated externally by a regeneration station.

Flow through filter (FTF) technology is a relatively new technology for reducing diesel PM emissions. Unlike a DPF, in which only gasses can pass through the substrate, the FTF does not physically "trap" and accumulate PM. Instead, exhaust flows through a medium (such as wire mesh) that has a high density of interrupted flow channels, thus giving rise to turbulent flow conditions. DOCs have straight flow passages and laminar flow conditions. The FTFs, with its turbulent flow, allow the exhaust gases to have more contact with the catalytic surface and longer residence times. The FTF medium is typically treated with an oxidizing catalyst that is able to reduce emissions of PM, ROG, and CO, or used in conjunction with a fuel-borne catalyst. Any particles that are not oxidized with the FTF flow out with the rest of the exhaust and do not accumulate.

The filtration efficiency of an FTF is lower than that of a DPF, but the FTF is much less likely to plug under unfavorable conditions, such as high PM emissions, low exhaust temperatures and emergency circumstances. The FTF, therefore, is a candidate for use in applications that are unsuitable for DPFs.

Combinations of more than one technology are also being explored to maximize the amount of diesel PM reduction. For example, fuel-borne catalysts can be combined with any of the three main hardware technologies discussed above: DPF, FTF or DOC.

Fuel Additives

Fuel additives are essentially any substances added to the fuel. These additives can reduce the total mass of PM, with variable effects on CO, NOx and ROG production. Fuel borne catalysts (FBC) are additives to diesel fuel to aid in soot removal in DPFs by lowering the ignition temperatures of the carbonacious particles in the exhaust stream. If the ignition temperature is lower, then more of the carbonaceous portion of the exhaust stream is incinerated and not trapped in the DPF. These FBCs are to be used in conjunction with passive and active DPFs. FBC's use various metals such as cerium, platinum, copper, and iron. Most fuel additives will work with a range of sulfur concentrations as well with other fuels and other fuel additives. FBCs are not verified for portable diesel engines at this time.

Alternative Diesel Fuels

An alternative diesel fuel is a fuel that can be used in a diesel engine without modification to the engine. Alternative diesel fuels include emulsified fuels, biodiesels, Fischer-Tropsch (F-T) fuels and any combination of these fuels with regular diesel fuels.

Water emulsion diesel fuel mixes water with diesel and adds an agent to keep the fuel and water from separating. The water is suspended in the droplets within the fuel, creating a cooling effect in the combustion chamber that decreases NOx emissions. A fuel-water emulsion creates a leaner fuel to air ratio in the combustion chamber, generating less soot at combustion, thus lowering PM emissions. The major manufacturer of this fuel-water emulsion is Lubrizol Corporation, which produces PuriNOx™. According to data submitted for the ARB's fuels certification procedure (Title 13, CCR, Sections 2281, 2282 and 2284), PuriNOx™ achieved a 14 percent reduction in NOx and a 63 percent reduction in PM emissions. Similar results were found in a United States Environmental Protection Agency (U.S. EPA, 2002c) analysis. Some engine manufacturers have stated that using emulsified fuels would void the engine warrantee.

Biodiesel is a mono-alkyl ester-based oxygenated fuel made from vegetable oils, such as oilseed plants or used vegetable oils, or animal fats. Biodiesel has similar properties to petroleum-based diesel fuel, and can be blended into petroleum-based diesel fuel at 20 percent, and is called B20. Pure biodiesel is called B100. U.S. EPA recently evaluated biodiesel using publicly available data and concluded that while biodiesel and biodiesel blends reduce PM, ROG, and CO emission, NOx emissions increase, depending on the biodiesel to diesel fuel blend ratio (U.S. EPA, 2002b). As the portion of biodiesel increase, the PM, ROG and CO emissions decrease while the NOx increases. U.S. EPA predicts that B20 will reduce fuel economy by one to two percent. Biodiesel costs more than double the cost of conventional diesel.

Fischer-Tropsch fuels have been used to some degree since the 1920s. Today, these fuels are being used in South Africa to power buses, trucks and taxicabs. Fischer-Tropsch technology converts coal, natural gas and low-value refinery products into a high-value, clean burning fuel. This fuel is interchangeable with conventional diesel fuel and can be blended with diesel fuel in any ratio with little or no modification (U.S. EPA, 2002a). Fischer-Tropsch fuels do have emissions reduction benefits. A study showed that PM emissions were reduced by 30 percent and NOx emissions by 5 percent (CEC, 2002). No alternative diesel fuels have been verified by the ARB for portable diesel engines.

Although there may be feasible control technology options developed or being developed, only one has been verified to date by the ARB for portable diesel engines. As more companies submit their products under the Verification Procedure, it is expected that more control technology options will be available for portable engine owners and operators in the future.

Appendix F

Exhaust Temperature Data Analysis for Portable Diesel-Fueled Engines

Exhaust Temperature Data Analysis for Portable Diesel-Fueled Engines

The University of California at Riverside's Center for Environmental Research and Technology (CE-CERT), working with ARB staff, recently conducted a stack-temperature profile (i.e., percentage of time at various exhaust temperatures) study to determine if passive diesel particulate filters (DPFs) are a feasible PM control technology for diesel-fueled portable engines. The success of a DPF is dependent on whether an engine achieves and maintains the minimum average exhaust temperature set by the DPF manufacturer. If engine exhaust temperatures are equal to or higher than the minimum temperatures, then passive DPFs could be considered as a potential retrofit control device. If engine exhaust temperatures are below the minimum requirements, then carbonaceous material may accumulate, increasing exhaust back pressure and possibly causing serious engine damage.

Currently, three manufacturers of passive DPFs have submitted their technology to ARB for verification for on-road diesel engine applications. These manufacturers are Johnson-Mathey, Cleair and Englehard. The required minimum average operating temperatures and duration per duty cycle vary among these DPFs. For example, the Johnson-Mathey DPF requires 270 degrees Celsius (C) for 40 to 50 percent of the duty cycle, the Cleair DPF requires 300 degrees C for 30 percent of the duty cycle, and the Englehard DPF requires an average of 225 degrees C. To date, these manufacturers have not requested ARB verification of their technologies for off-road applications, which would include portable diesel engines.

In the study, CE-CERT gathered exhaust temperatures during normal duty cycles from about 80 portable diesel engines in Northern and Southern California. The engines ranged from 77 to 2151 horsepower. The tests consisted of inserting a temperature sensor into the exhaust stream of a diesel engine, after the turbo-charger or exhaust manifold, and measuring the exhaust temperature in one-minute intervals for at least 20 hours of engine operation. Exhaust temperature data was stored on an in-line data logger. The data were downloaded from the data logger to a laptop and a frequency distribution test was applied using a spreadsheet. A frequency distribution test was used on the data to determine what temperature range each engine operated at and the percentage of time it operated within each temperature interval. The resulting data were graphed by temperature verses percent engine operation (See Figures 1-80). Table 1 is a summary of the equipment categories that were tested, the number of engines tested per category, and the percentage of those engines tested where the minimum operating temperature was high enough to install a passive DPF.

Table 1: Results of Exhaust Temperature Tests

Category	Industry	Number of Engines Tested	Passive DPF Yes
			(%)
Wood Chippers	Arborist, University, Govt.	7	43
Generators	Motion Picture, Construction, Sand & Gravel, Oil & Gas	29	73
Paint Stripers (Compressors)	Govt.	6	83
Compressors	Govt., Construction	11	55
Pumps	Govt., Oil & Gas, Agricult.	8	63
Grinders	Govt.	3	100
Grader/Shovel	Govt.	2	50
Welder	Sand and Gravel	1	100
Crane	Construction	1	0
Jet Washer	Oil & Gas	3	0
Drilling Rig	Oil & Gas	1	0
Clamshell Dredger	Construction	2	0
Bow Anchor Winch	Construction	1	0
Truck Mounted Vacuum Pumps	Govt.	5	0

The staff assumed that a minimum average operating temperature above 225 degrees C was needed to successfully retrofit with a passive DPF. The results of the test data showed that not all engines could be retrofitted with DPFs. The duty cycle appears to be the key to determining a successful retrofit of a passive DPF. Although some of the categories did show 100 percent of engines tested were capable of being retrofit with a passive DPF, Grinders and Cranes (Figures 61, 62 and 67), there wasn't enough of a population base to test and confirm if this was true for all engines in this category.

Some categories would be good candidates for a passive DPF, paint stripers for example (Figures 36-41). Paint stripers are either painting or turned off. There is a minimum amount of idling, so that the average exhaust temperatures are higher. As the data shows, 83 percent of these paint stripers could be retrofitted with a passive DPF.

In some categories retrofitting with a passive DPF is on a case by case basis. The generator category (Figures 8-35) is an example of the need to test before

installing a passive DPF. From the test results, 73% could be retrofitted with a passive DPF. For the other 27%, generators appear to run at idle for long periods of time and when electrical power is needed then they are operated at full power. This appears to be the case in the movie industry, where generators of the same horsepower rating had very different duty cycles. Some had very low average exhaust temperatures while other generators maintained operating temperatures much higher than the minimum required temperature. Operators of generators would need to perform exhaust temperature tests to determine if their engine would be a candidate for a passive DPF.

Some categories would not be good candidates for a passive DPF, vacuum trucks for example (Figures 76-80). These trucks vacuum leaves and debris from storm drains, keeping storm drains clear. Data indicated that these vacuum pumps had engines that were larger and more powerful than what was needed to remove the average amount of obstruction. These trucks were designed with reserve power so that if a large amount of debris was in a storm drain it could be removed quickly. During testing, these engines never reached the minimum temperature of 225-degree Celsius for the minimum amount of time.

Based on the exhaust test results, the ARB cannot recommend the use of a passive DPF for all portable diesel engines because in many cases the duty cycle of an engine may not reach the minimum temperatures required for a passive DPF to perform its function. If an operator decides to use a passive DPF, an engine exhaust temperature study is highly recommended to determine if the average engine exhaust temperatures for individual engines do meet the minimum requirements for a passive DPF.

Chippers

Figure 1: Cecert 16 Exhaust Temperature Profile
Application: Chipper

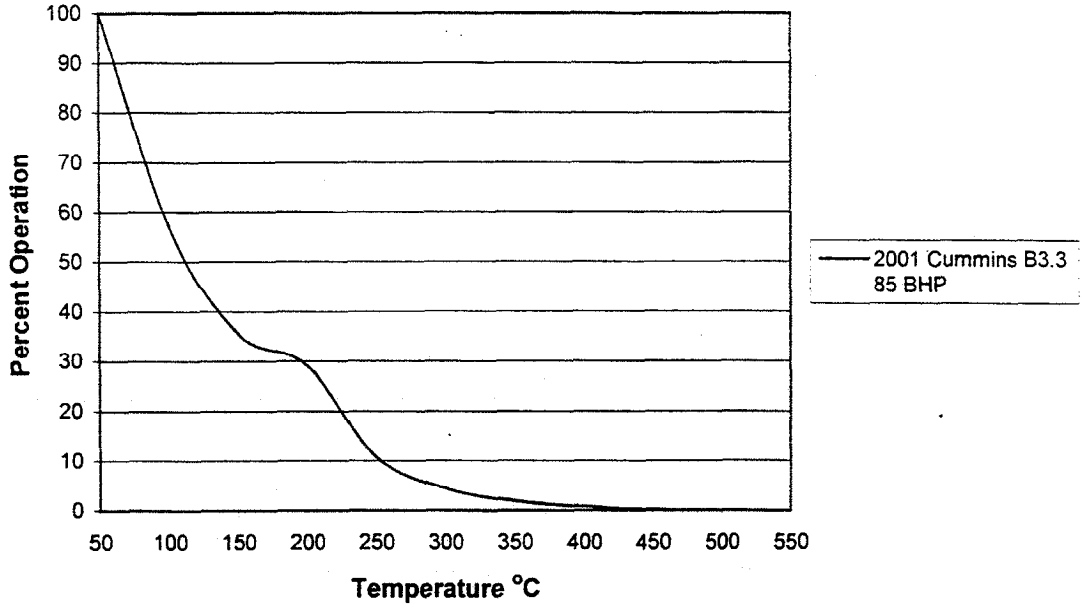


Figure 2: Cecert 17 Exhaust Temperature Profile
Application: Chipper

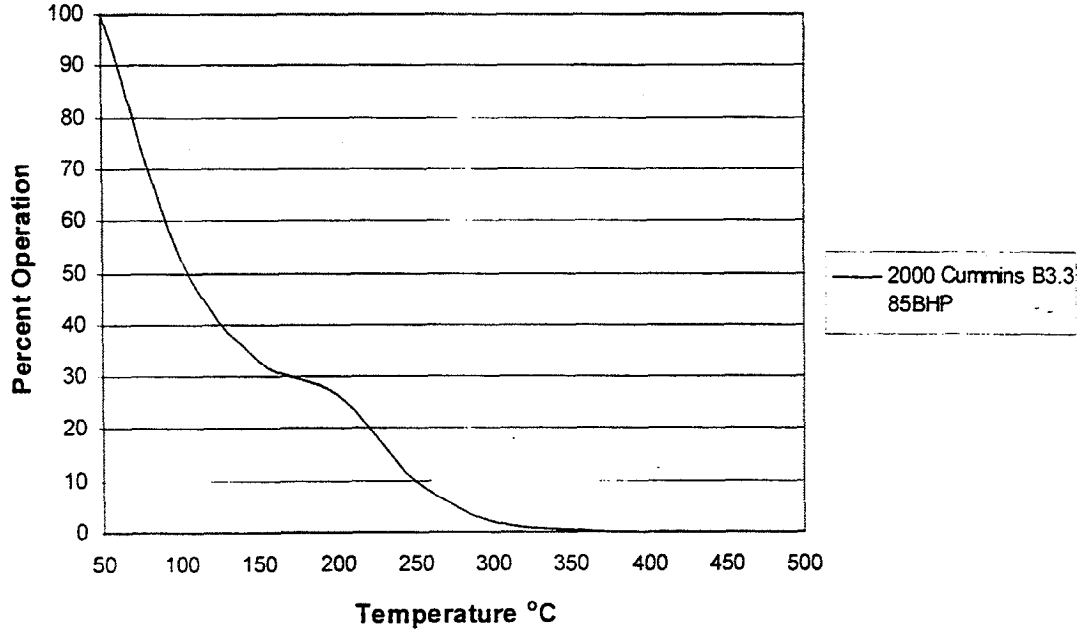


Figure 3: Cecert 18 Exhaust Temperature Profile
Application: Chipper

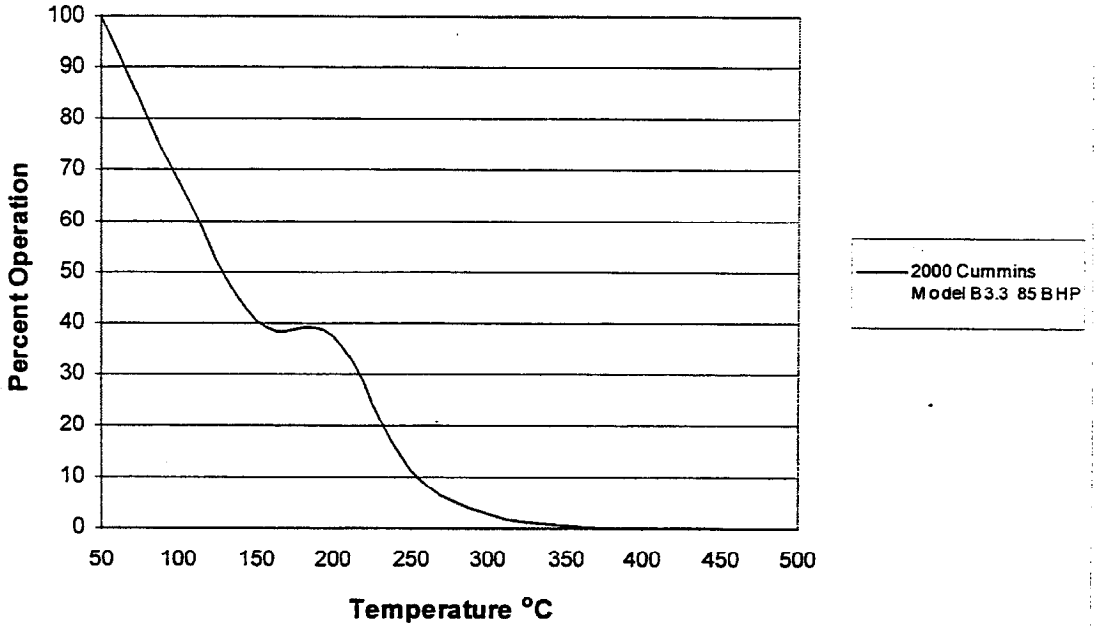


Figure 4: Cecert 23 Exhaust Temperature Profile
Application: Chipper

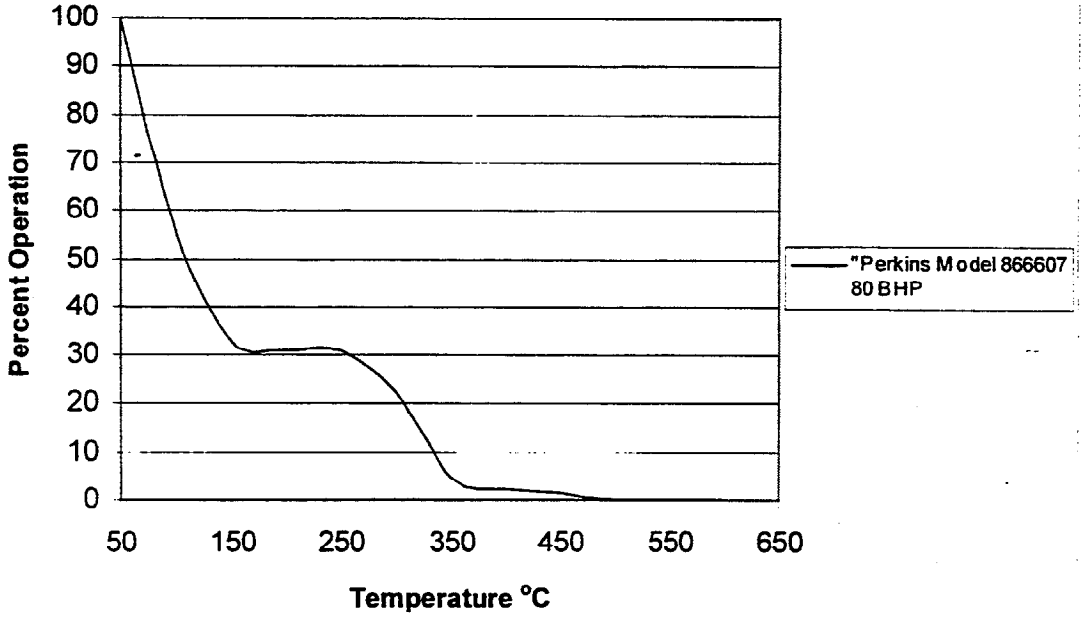


Figure 5: Cecert 24 Exhaust Temperature Profile
Application: Chipper

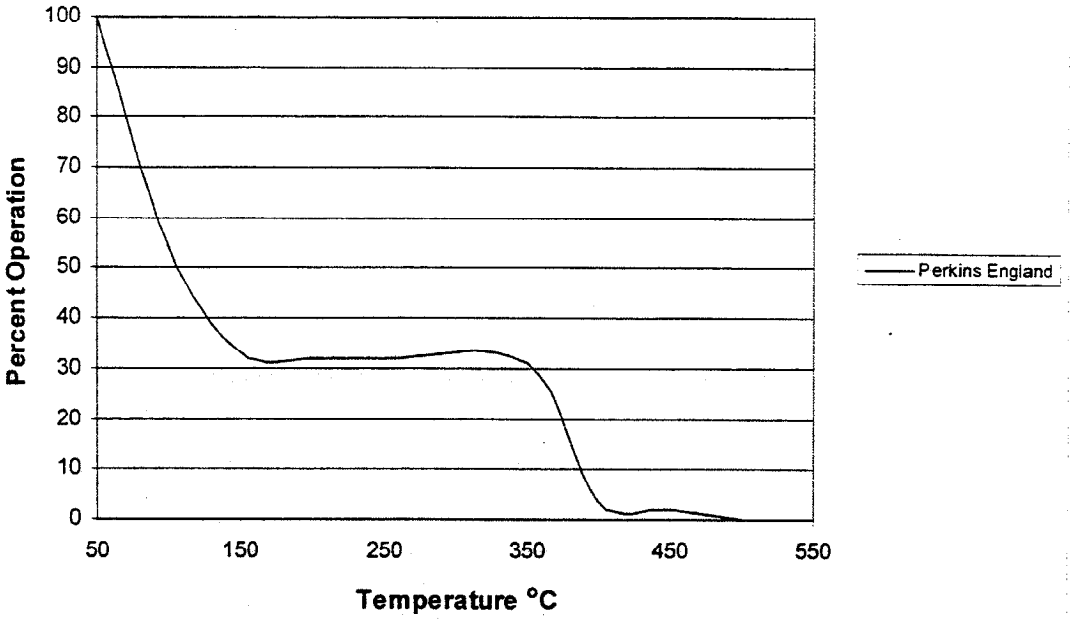


Figure 6: 2526069 Exhaust Temperatures Profile
Application: Chipper

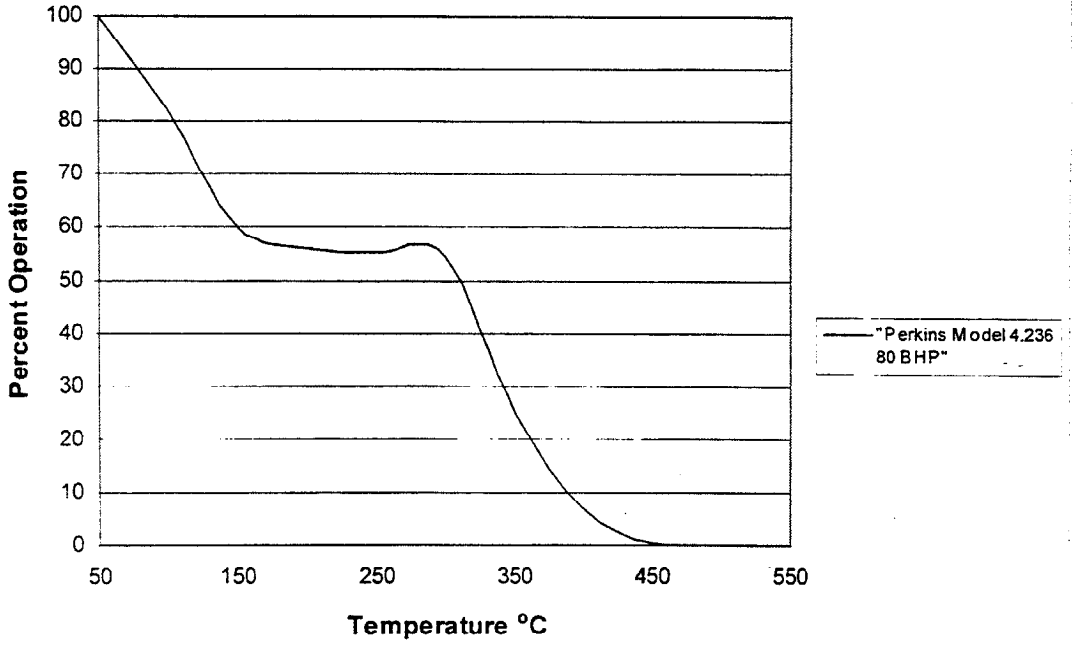
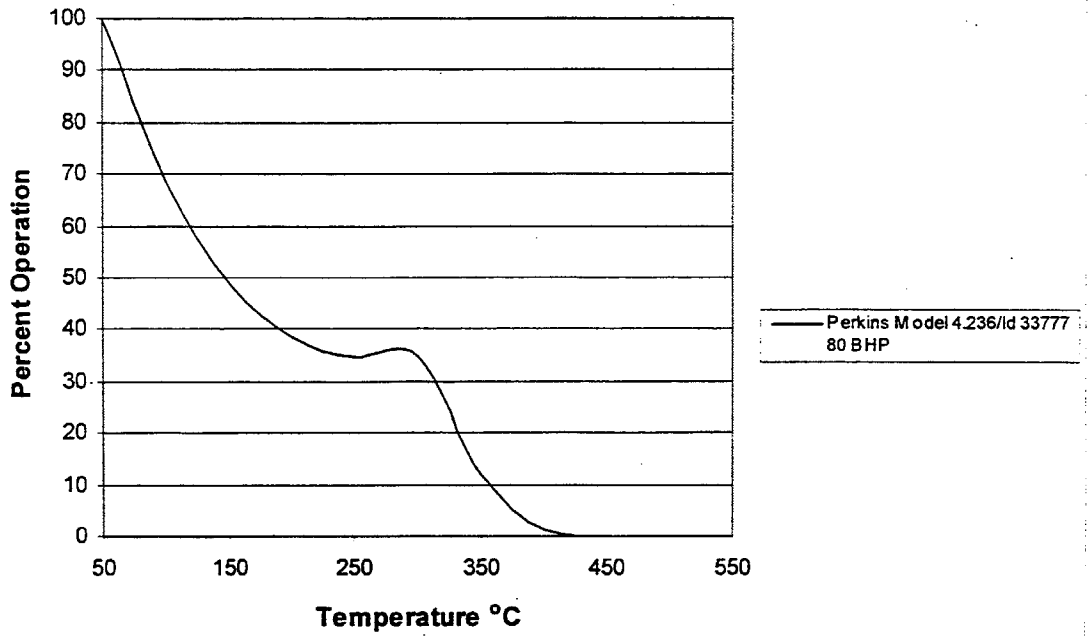


Figure 7: 2526822 Exhaust Temperatures Profile
Application: Chipper



Generators

Figure 8: Cecert 26 Exahust Temperature Profile
Application: Generator for a Water Pump

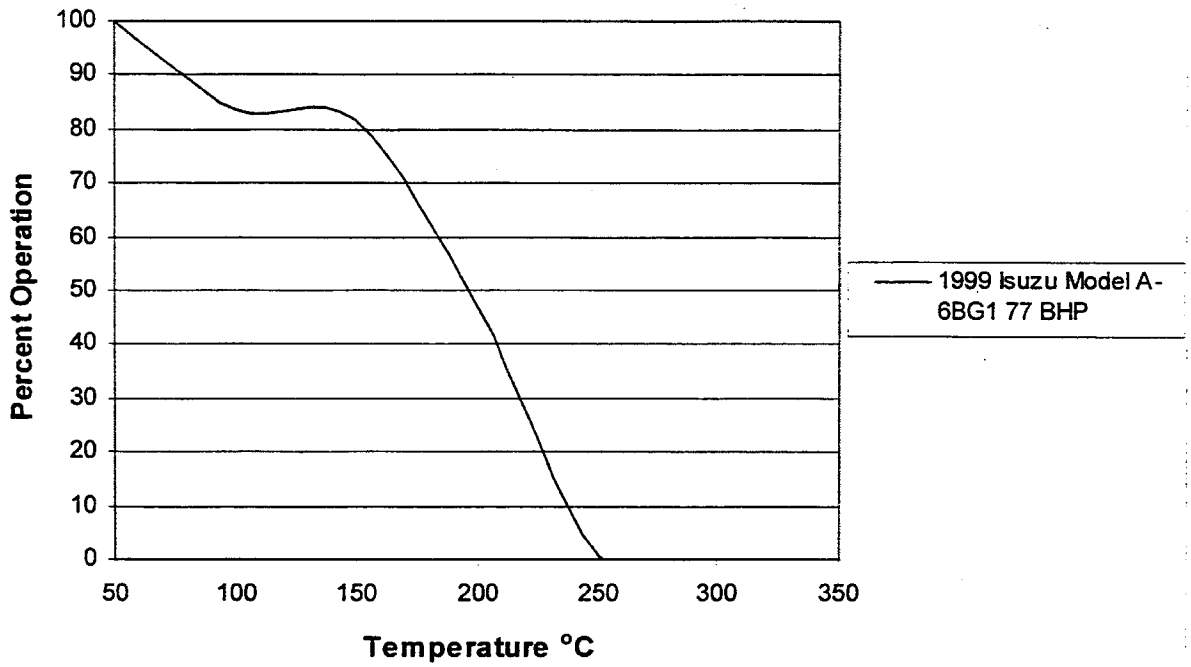


Figure 9: Cecert 27 Exhaust Temperature Profile
Application: Rental Generator

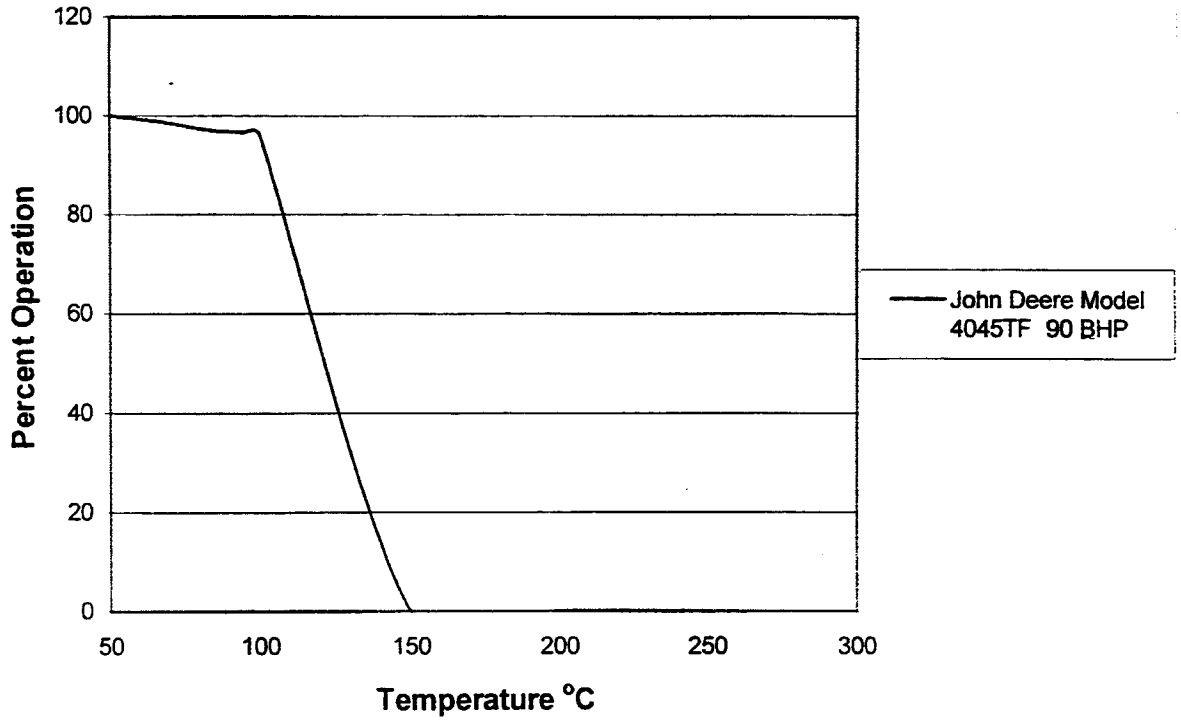


Figure 10: Cecert 28 Exhaust Temperature Profile
Application: Rental Generator

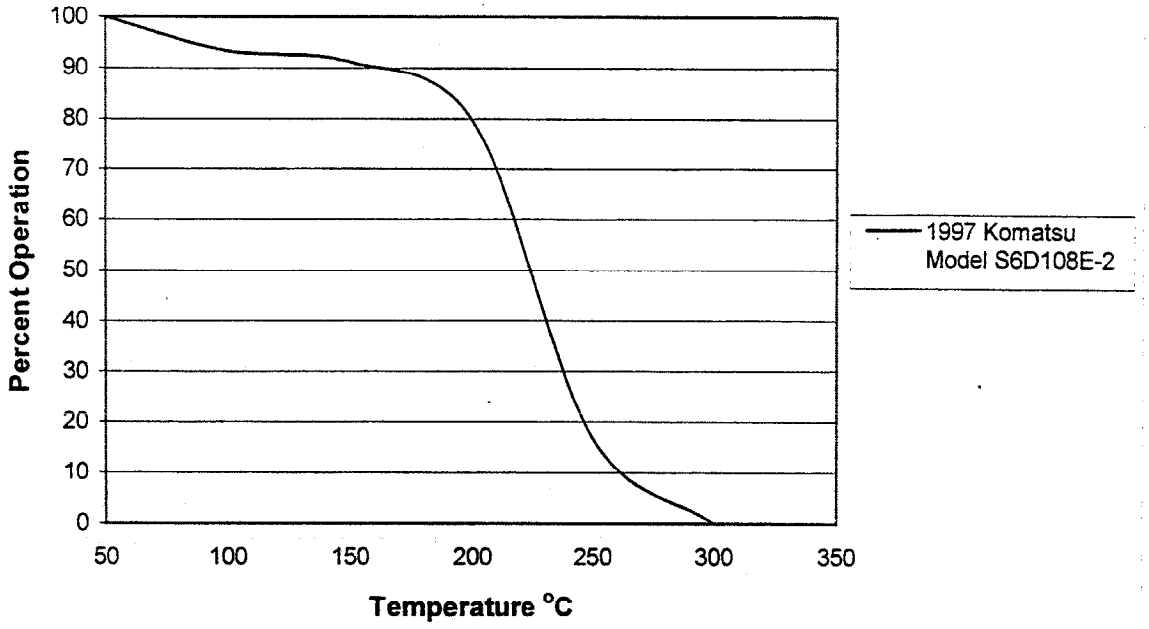


Figure 11: Cecert 29 Exhaust Temperature Profile
Application: Rental Generator

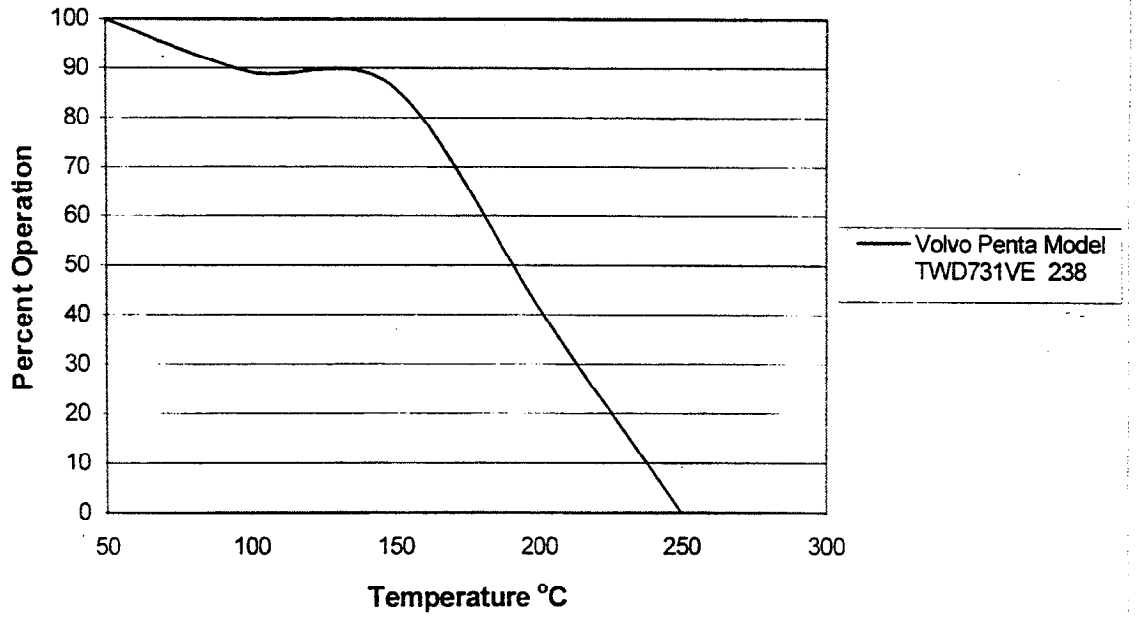


Figure 12: Cecert 30 Exhaust Temperature Profile
Application: Generator

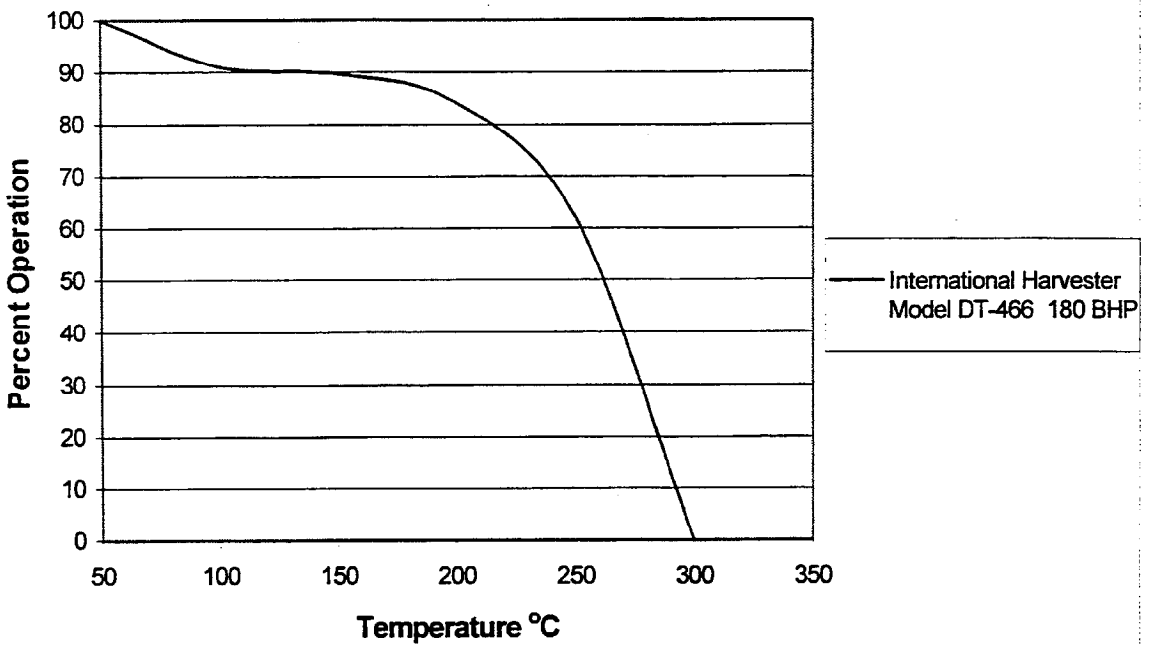


Figure 13: Cecert 32 Exhaust Temperature Profile
Application: Lighting Generator

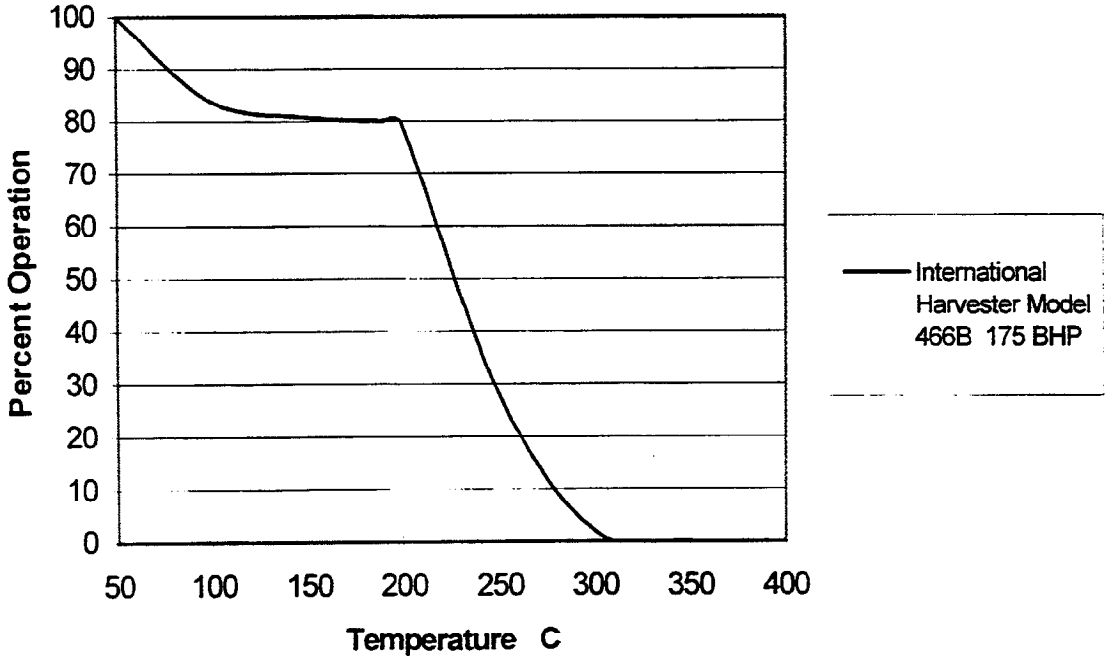


Figure 14: Cecert 33 Exhaust Temperature Profile
Application: Lighting Generator

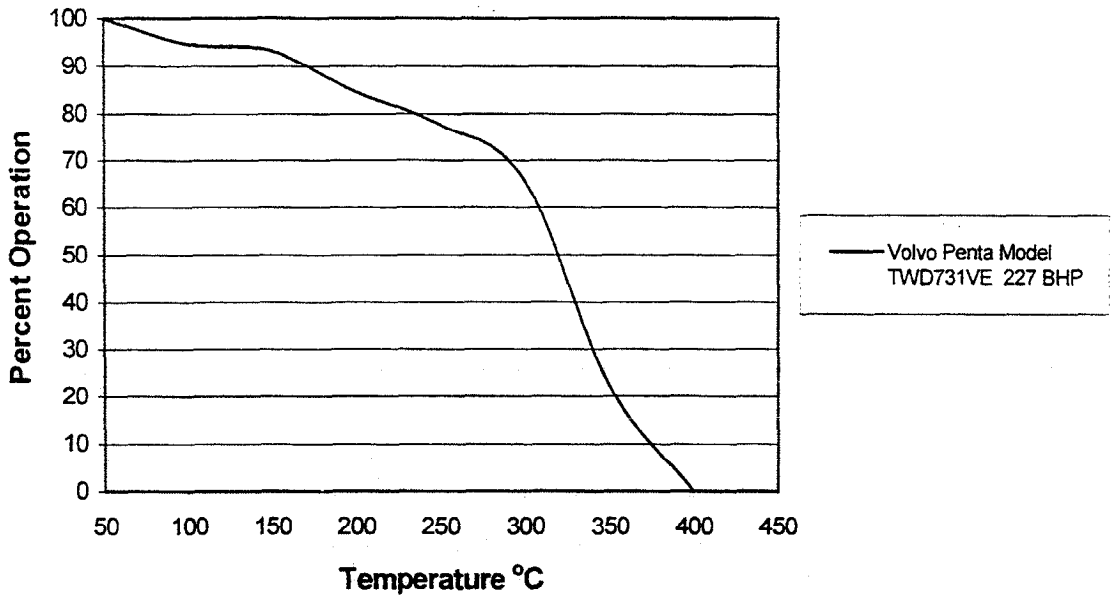


Figure 15: Cecert 34 Exhaust Temperature Profile
Application: Lighting Generator

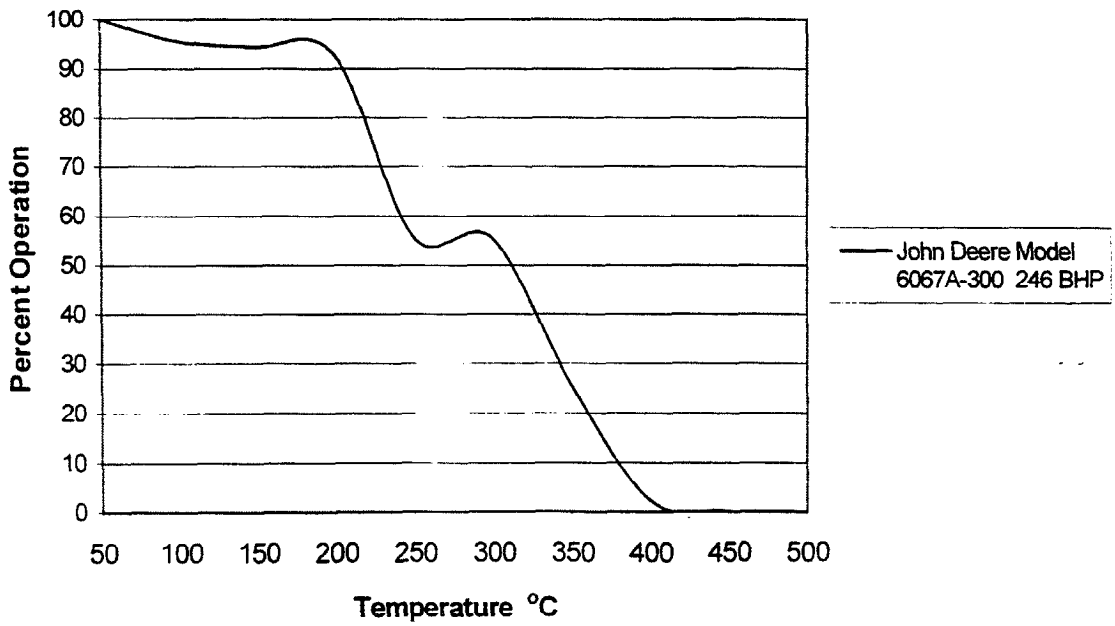


Figure 16: Cecert 36 Exhaust Temperature Profile
Application: Lighting Generator

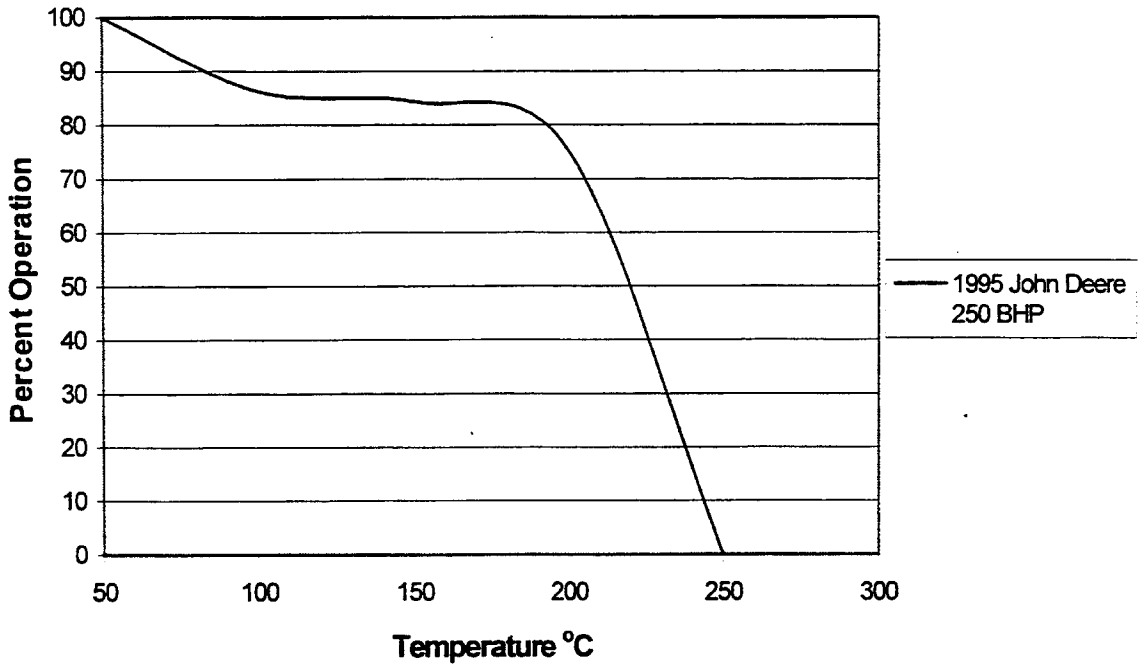


Figure 17: Cecert 37 Exhaust Temperature Profile
Application: Lighting Generator

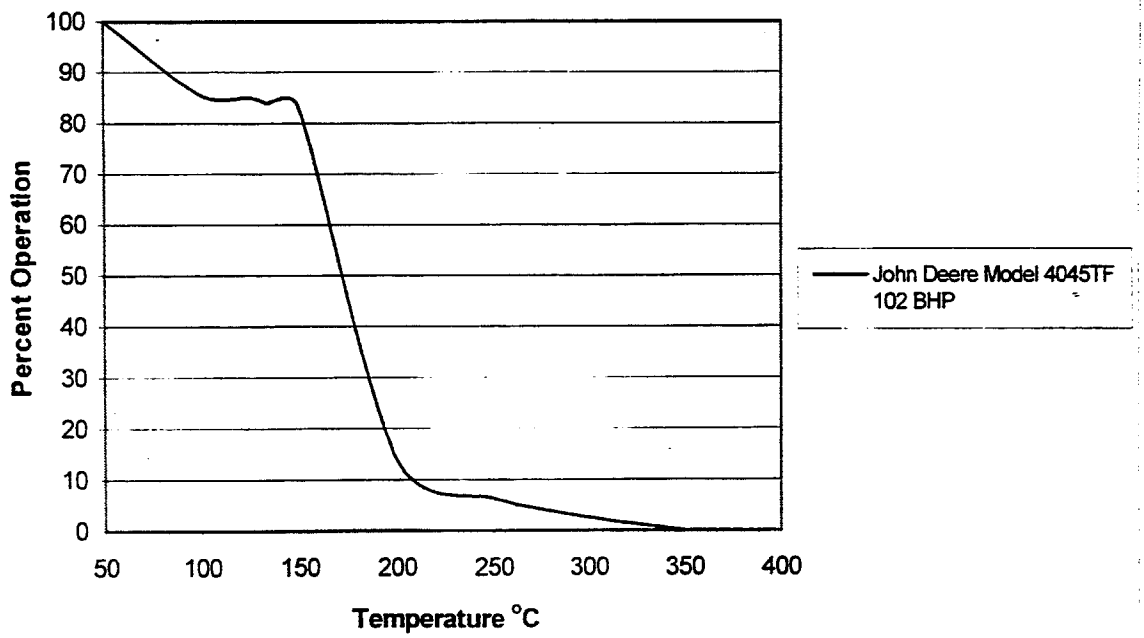


Figure 18: Cecert 38 Exhaust Temperature Profile
Application: Lighting Generator

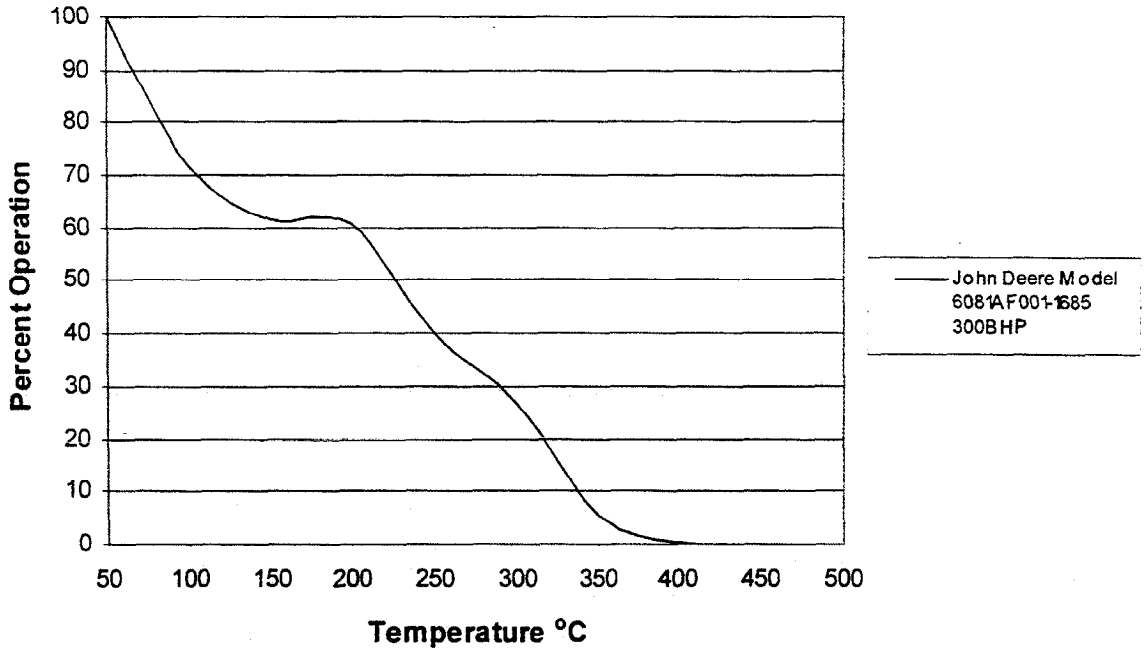


Figure 19: 102261 Exhaust Temperature Profile
Application: Conveyor Generator

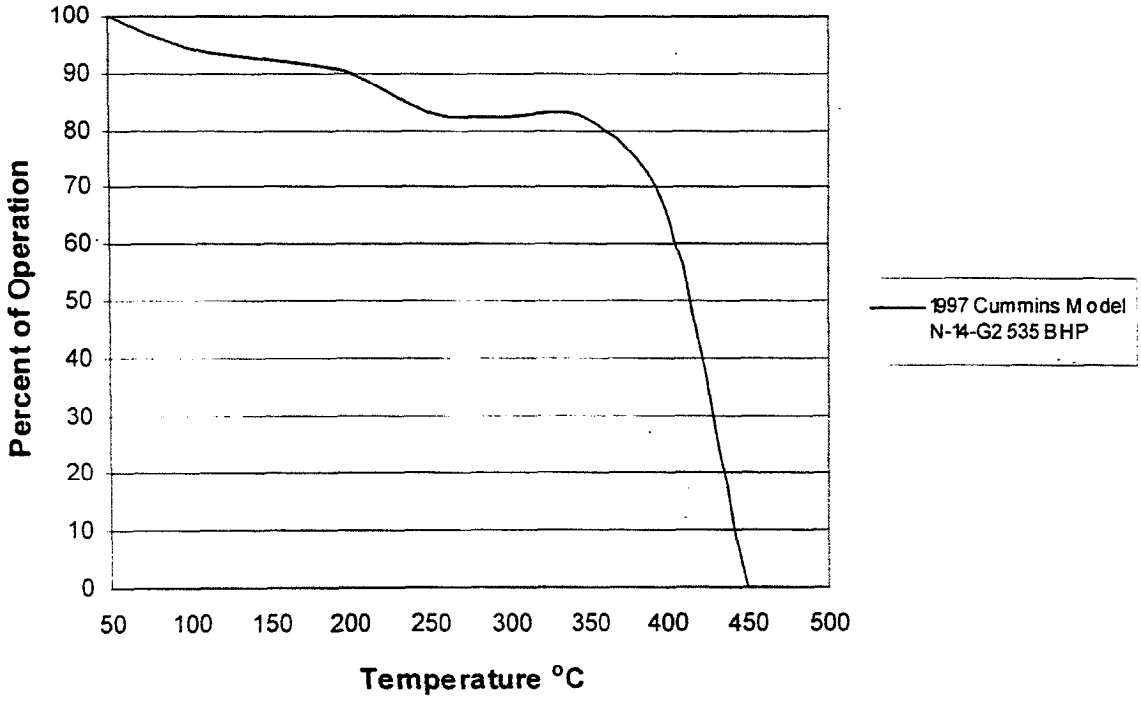


Figure 20: 1022622 Diesel Exhaust Temperature Profile
Application: Conveyor Generator

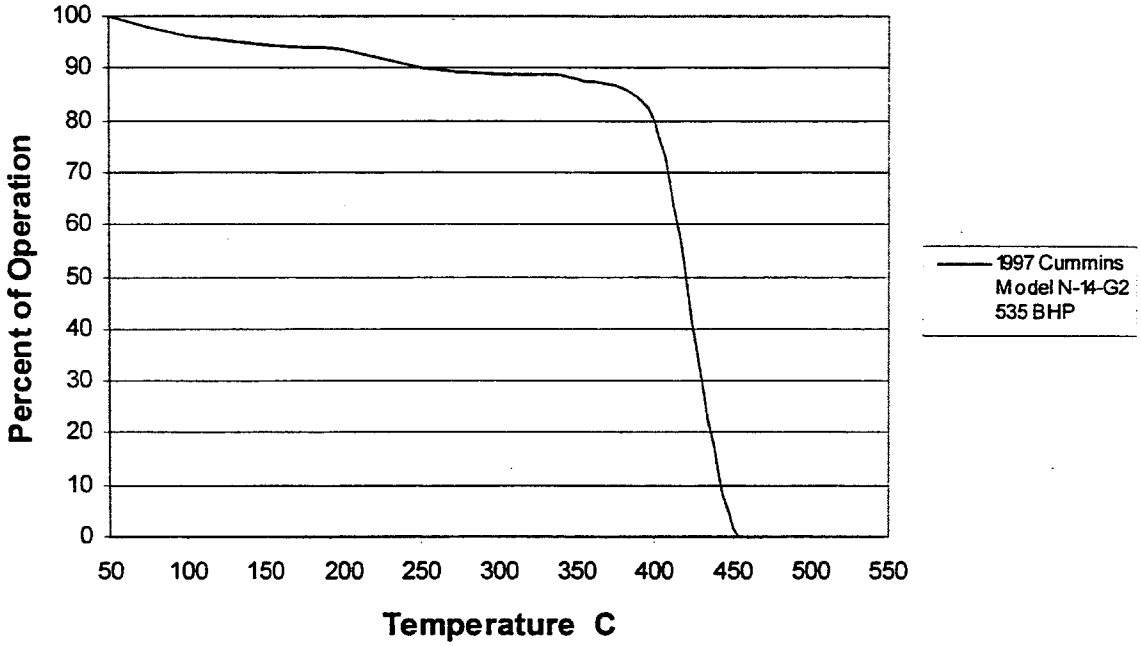


Figure 21: 105571 Engine Exhaust Profile
Application: Powerscreen Generator

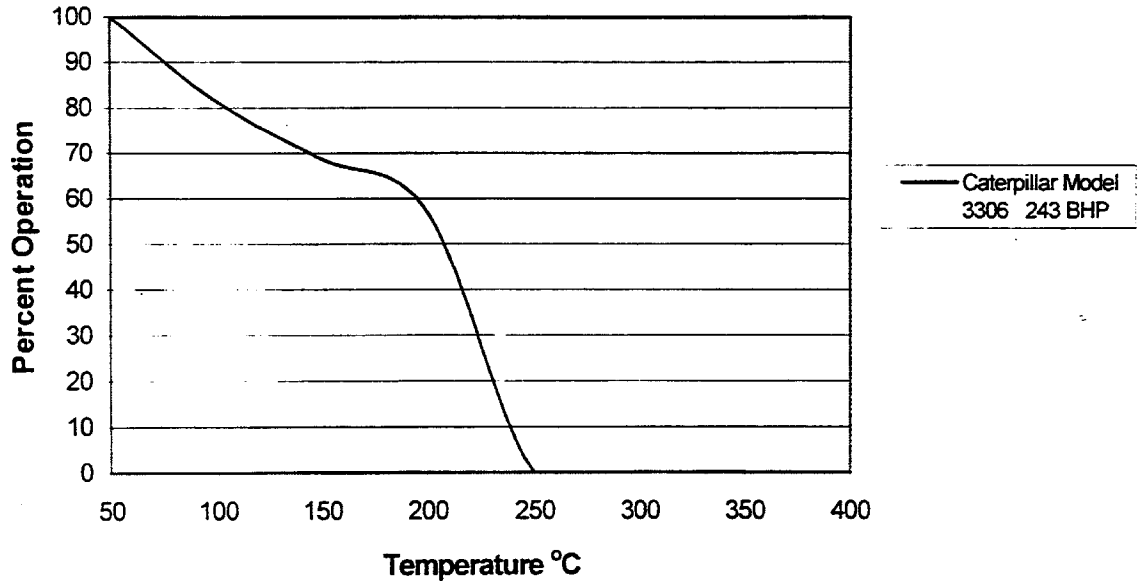


Figure 22: 111223 Exhaust Temperatue Profile
Application: Rock Crushing & Screening Generator

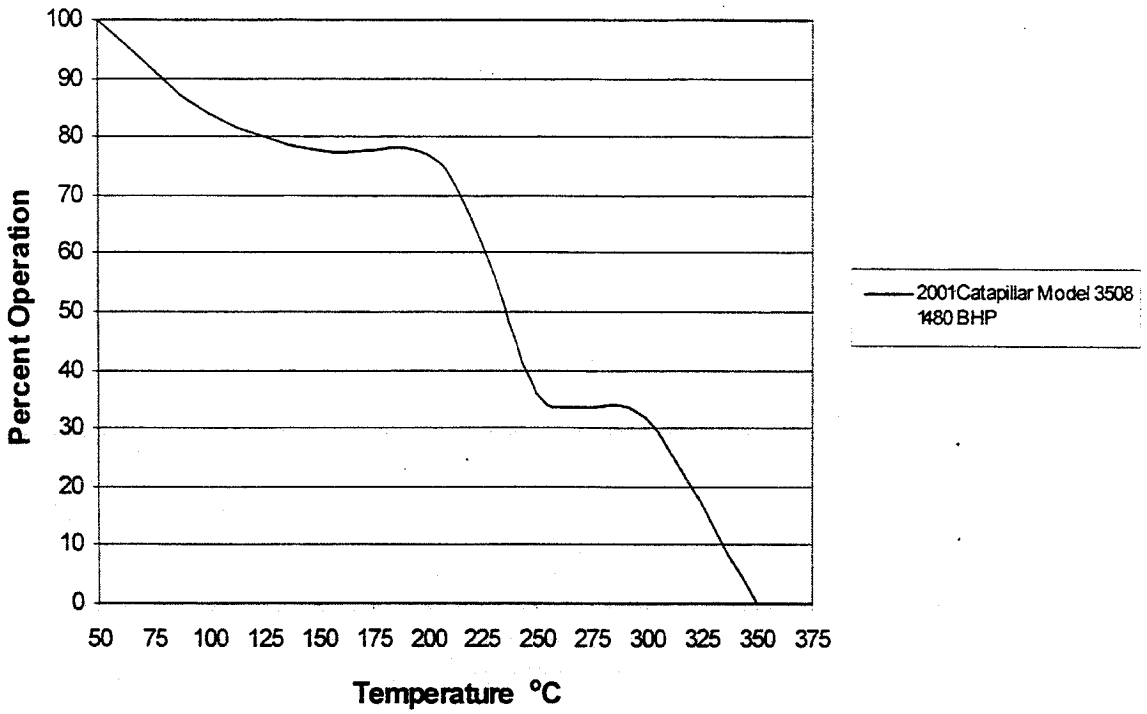


Figure 23: 111226 Exhaust Temperature Profile
Application: Rock Crushing & Screening Generator

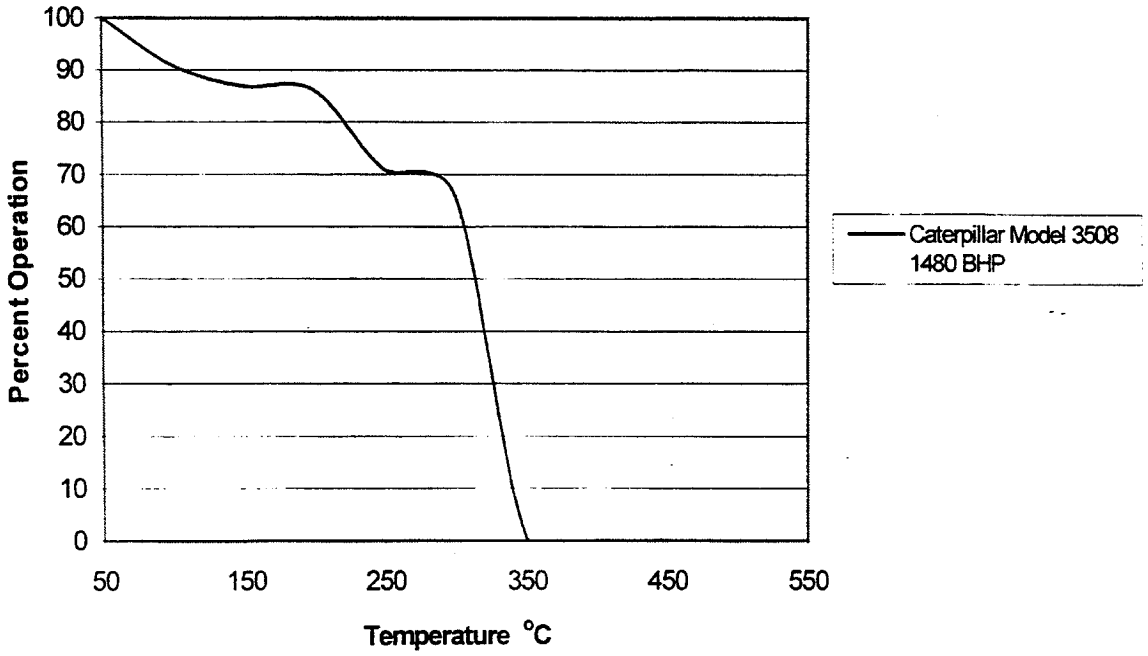


Figure 24: 113879 Exhaust Temperature Profile
Application: Generator Set

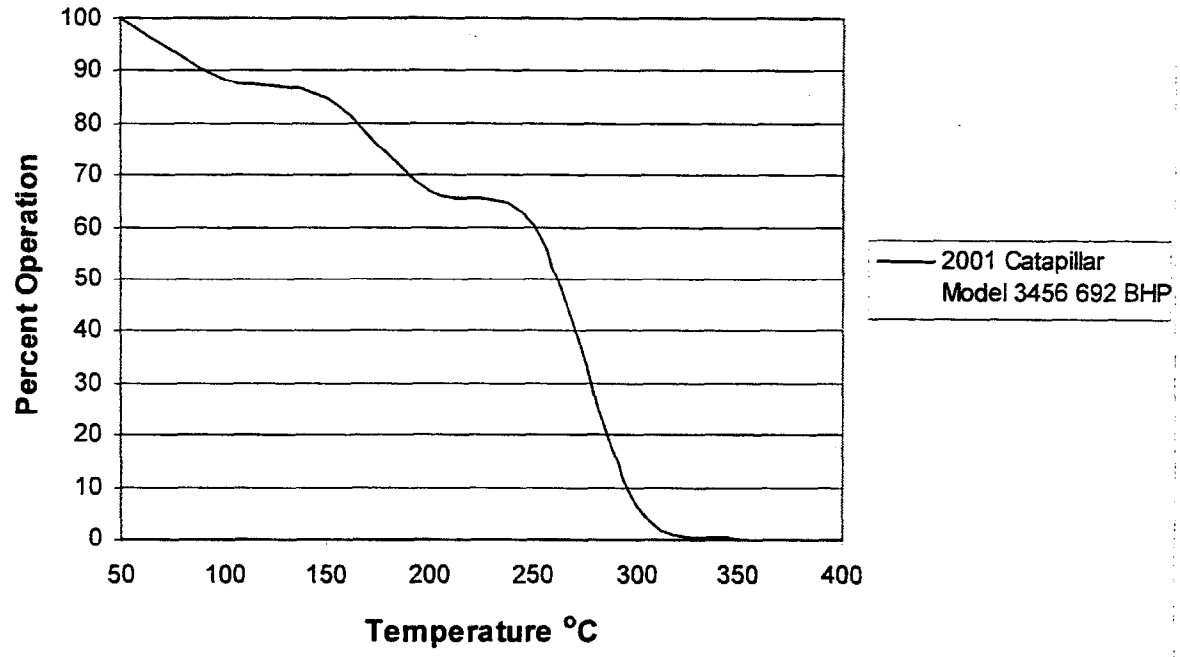


Figure 25: 114235 Exhaust Temperature Profile
Application: Power Conveyor Generator

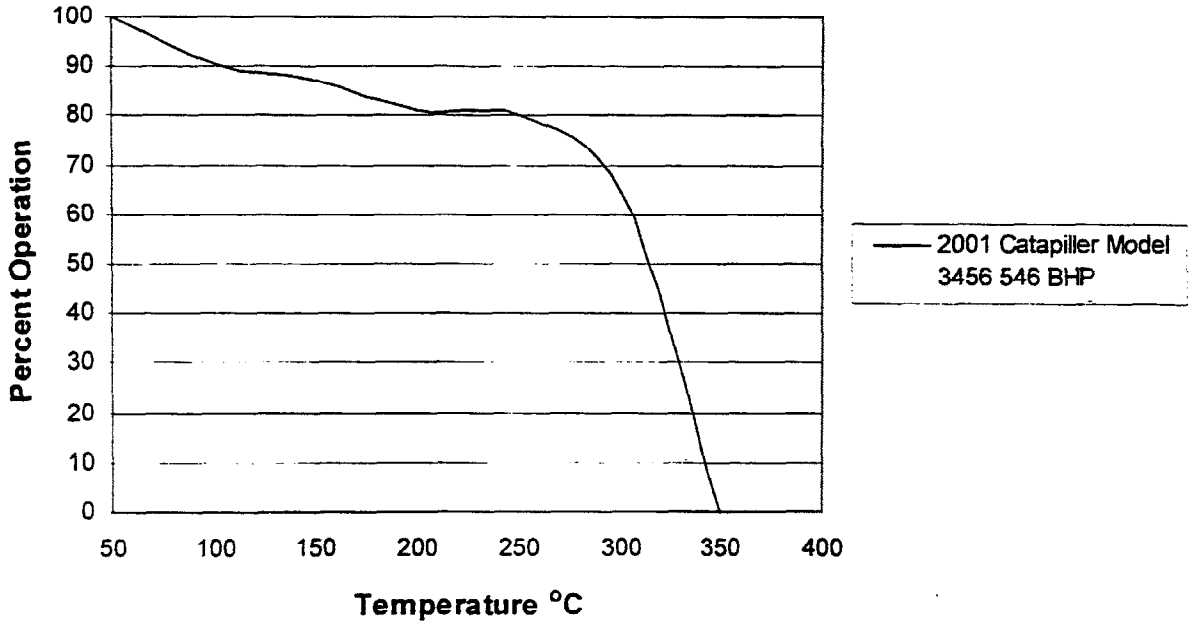


Figure 26: 114750 Exhaust Temperature Profile
Application: Rock Crushing & Screening Generator

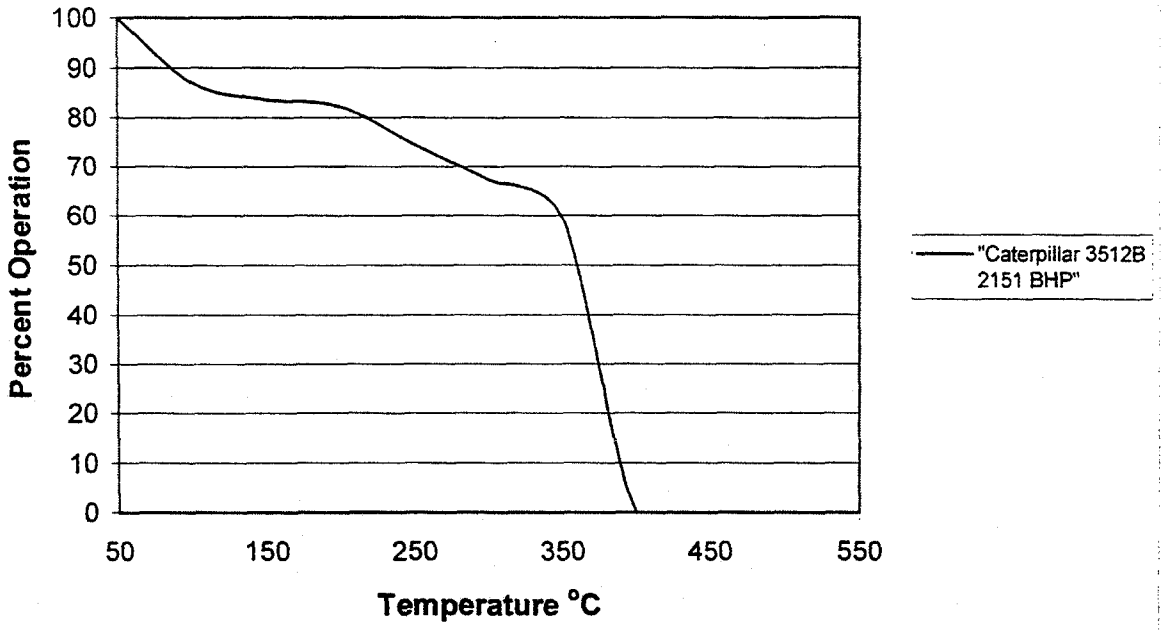


Figure 27: 114775 Exhaust Temperature Profile
Application: Conveyor Generator

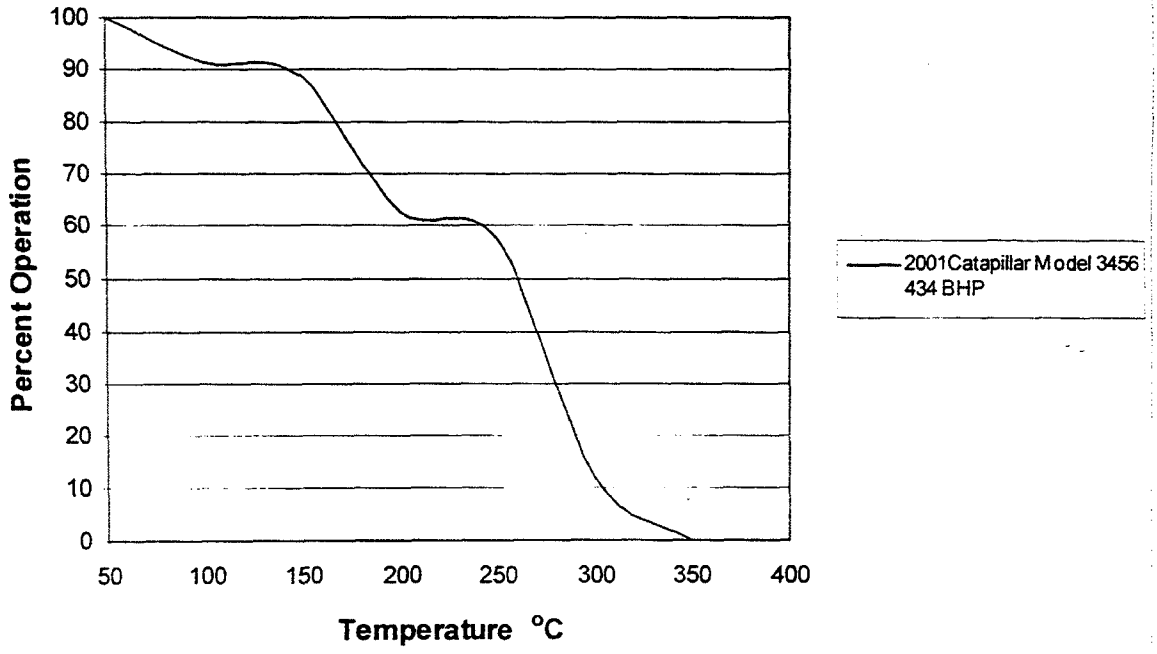


Figure 28: 111624 Exhaust Temperatures Profile
Application: Teichert Powerscreen Diesel Generator

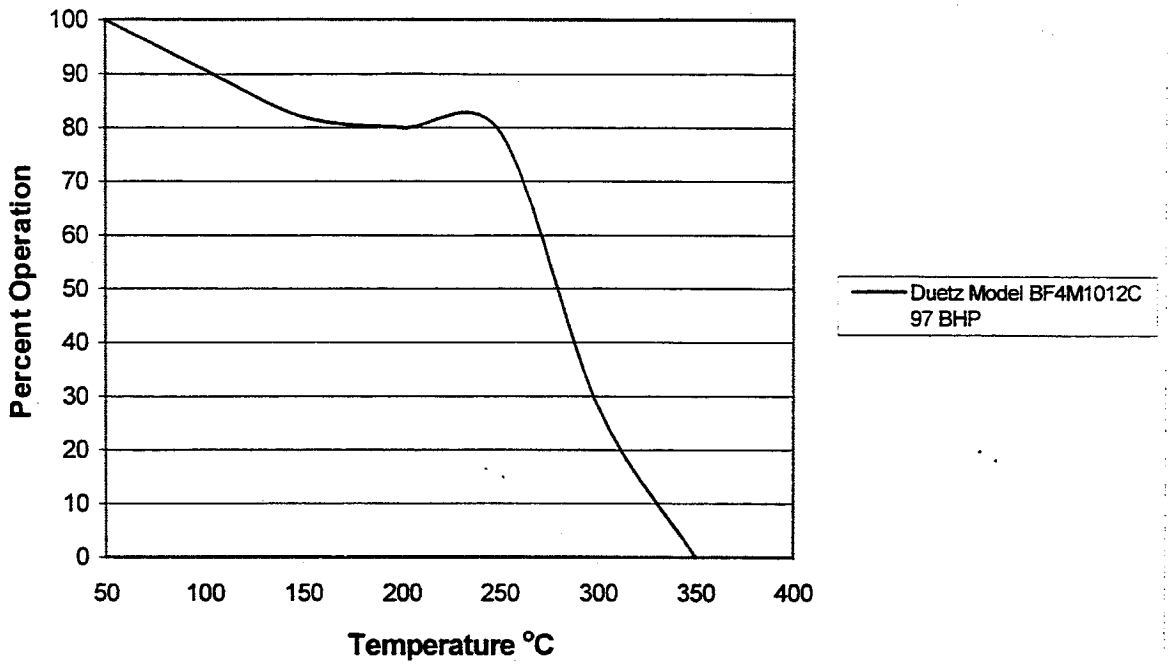


Figure 29: Cecert 14 Exhaust Temperature Profile
Application: F.S.T. Sand and Gravel Screening Plant Generator

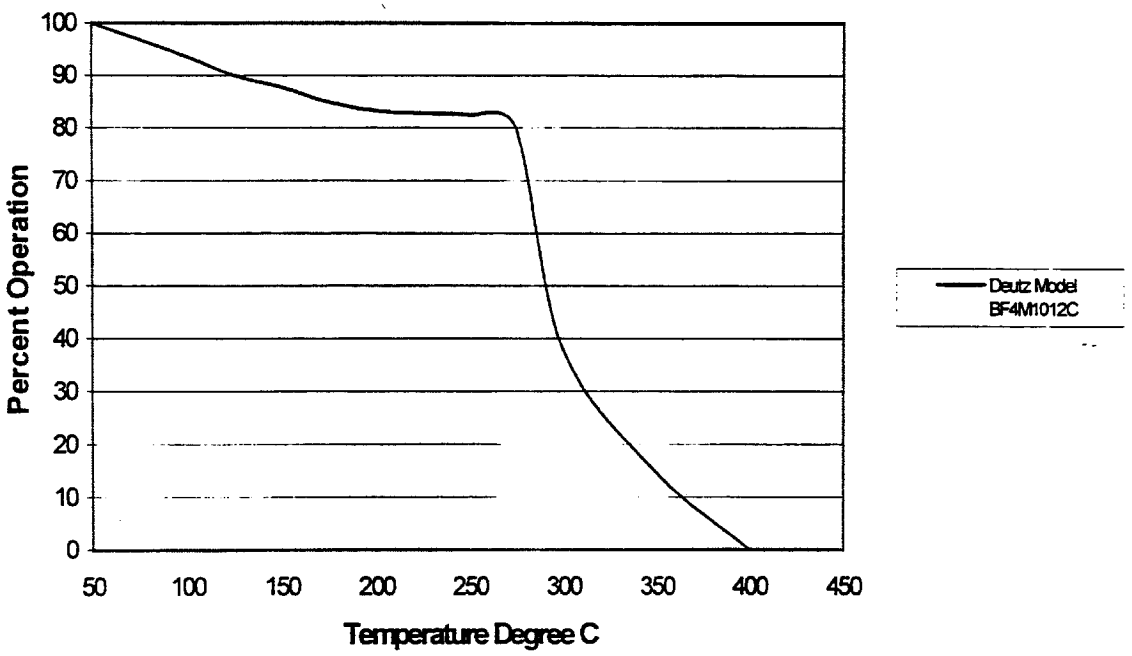


Figure 30: 20004321 Exhaust Temperature Profile
Application: Aggregate Recycler Generator

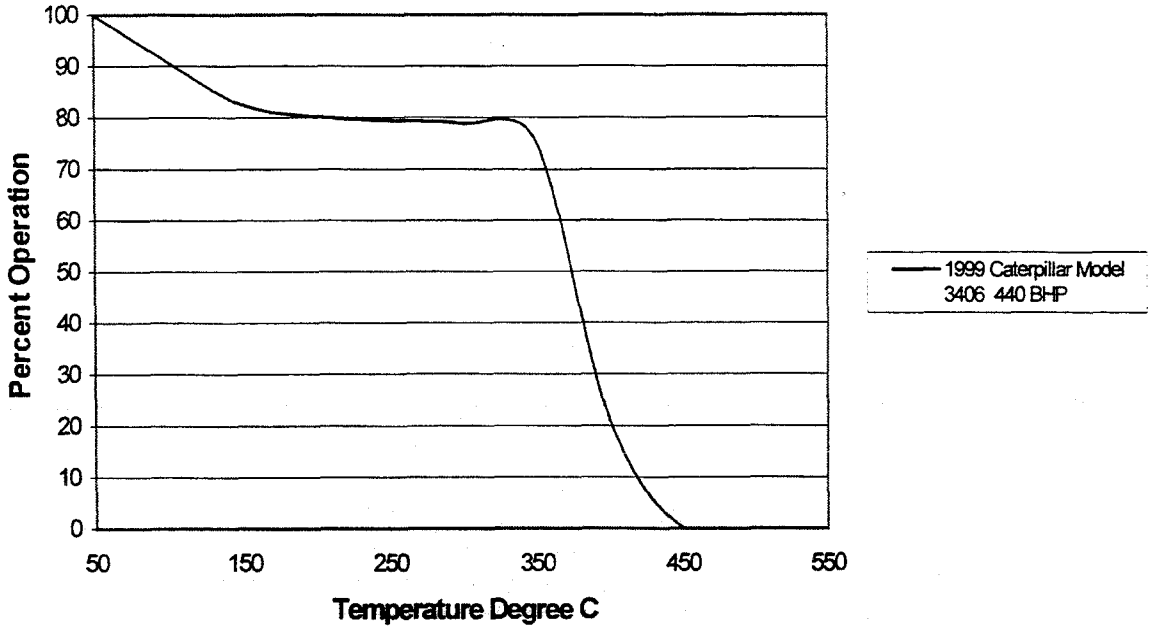


Figure 31: 20022977 Exhaust Temperature Profile
Application: Radial Stacker Generator

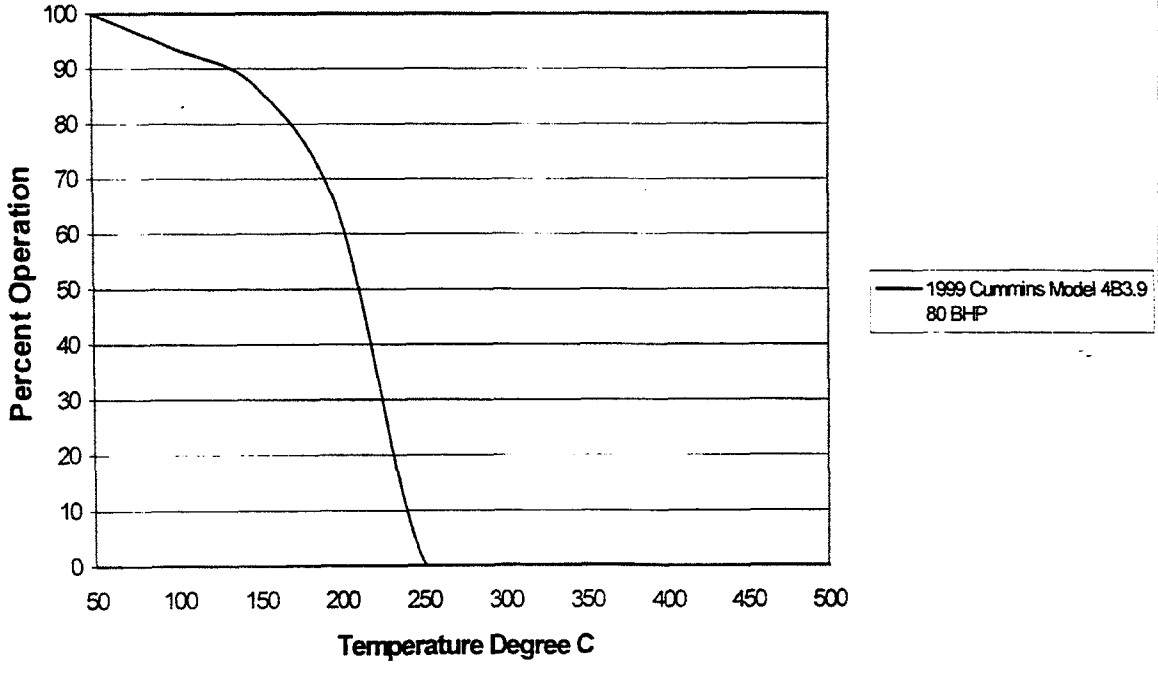


Figure 32: Cecert 43 Exhaust Temperature Profile
Application: R Crusher Generator

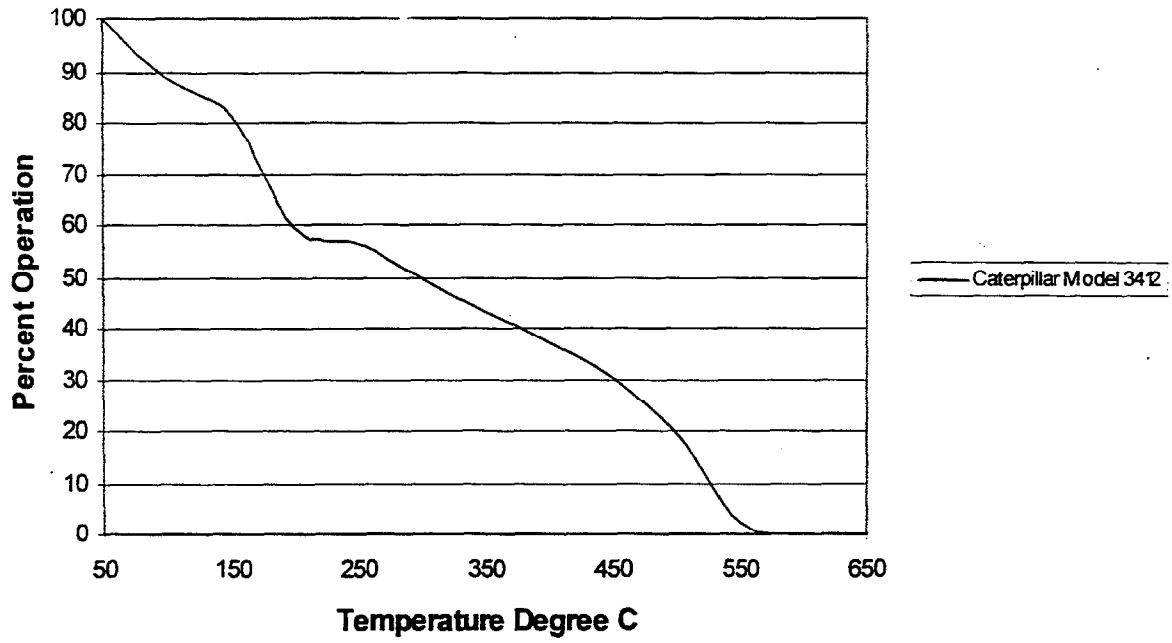


Figure 33: Powerscreen 1800 Exhaust Temperature Profile
Application: Screener Generator

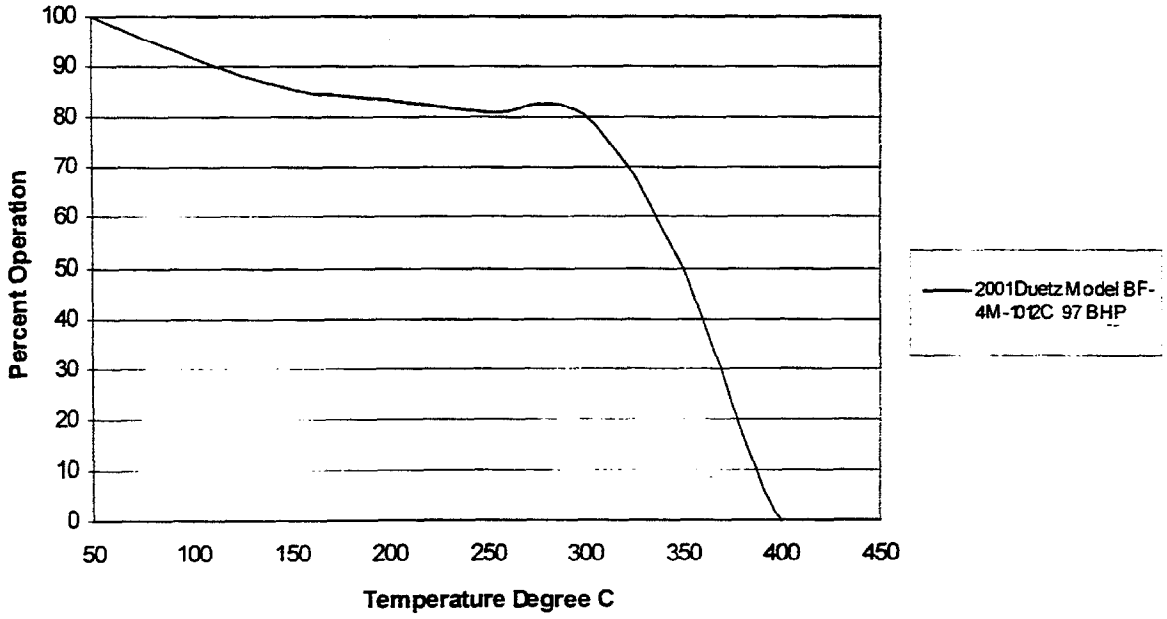


Figure 34: 108739 Engine Exhaust Temperature
Application: Drilling Rig Generator

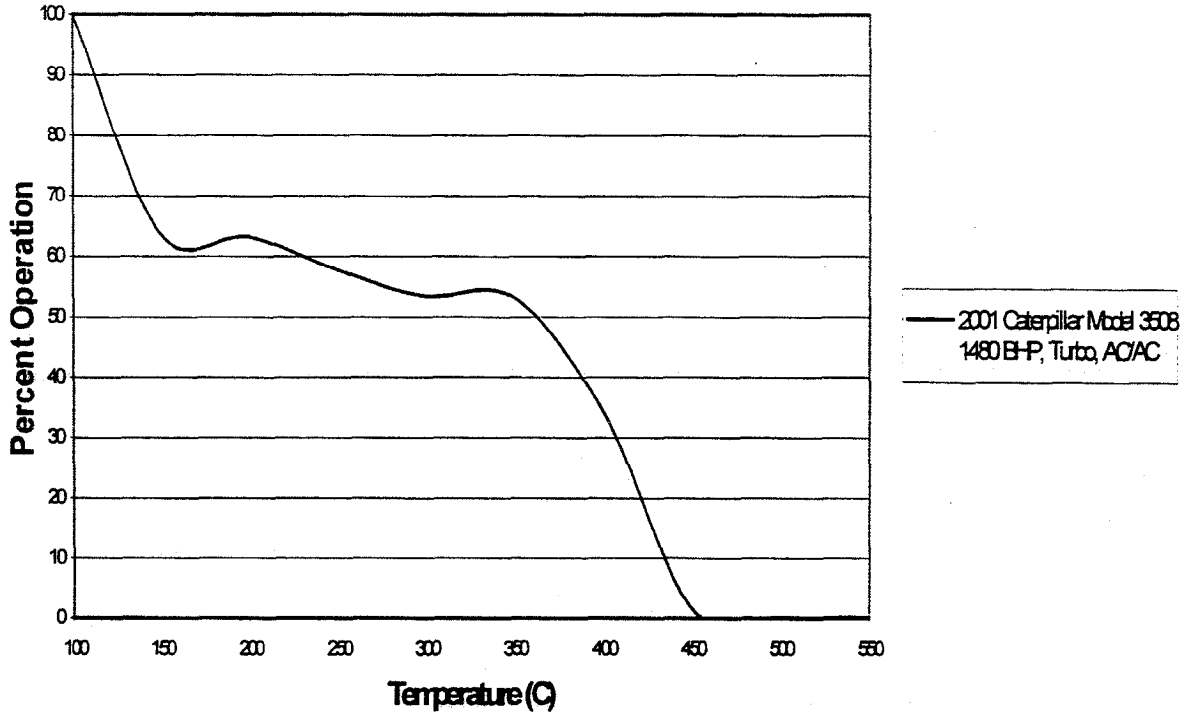
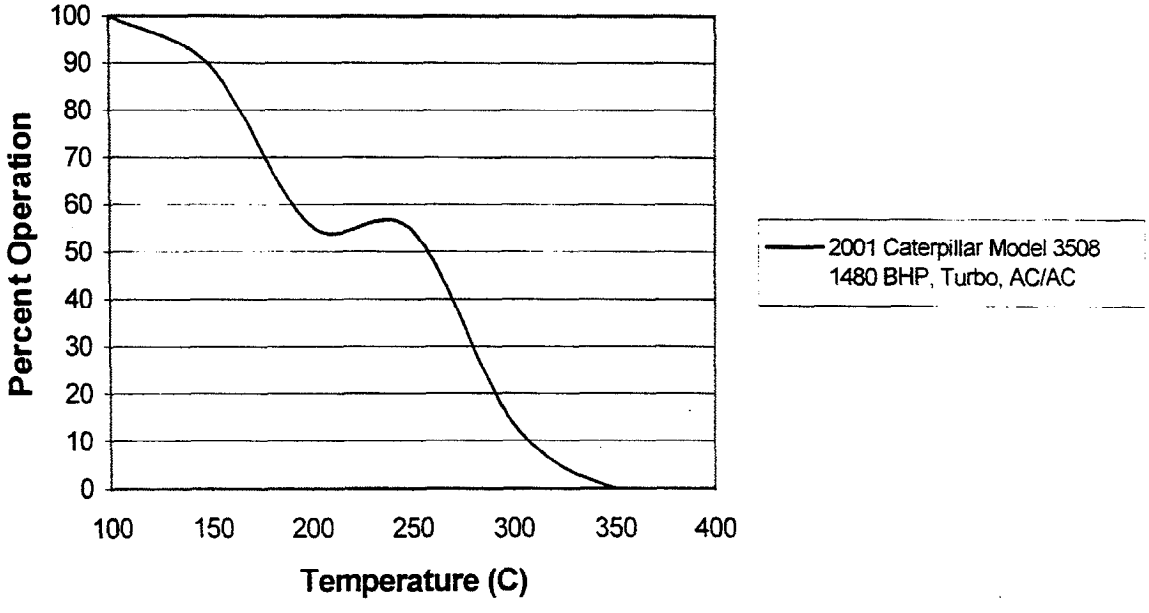


Figure 35: 7810876 Engine Exhaust Temperature Profile
Application: Generator Genrig



Paint Striper Compressor

Figure 36: 0534128 Exhaust Temperature Profile
Application: Paint Striper Compressor

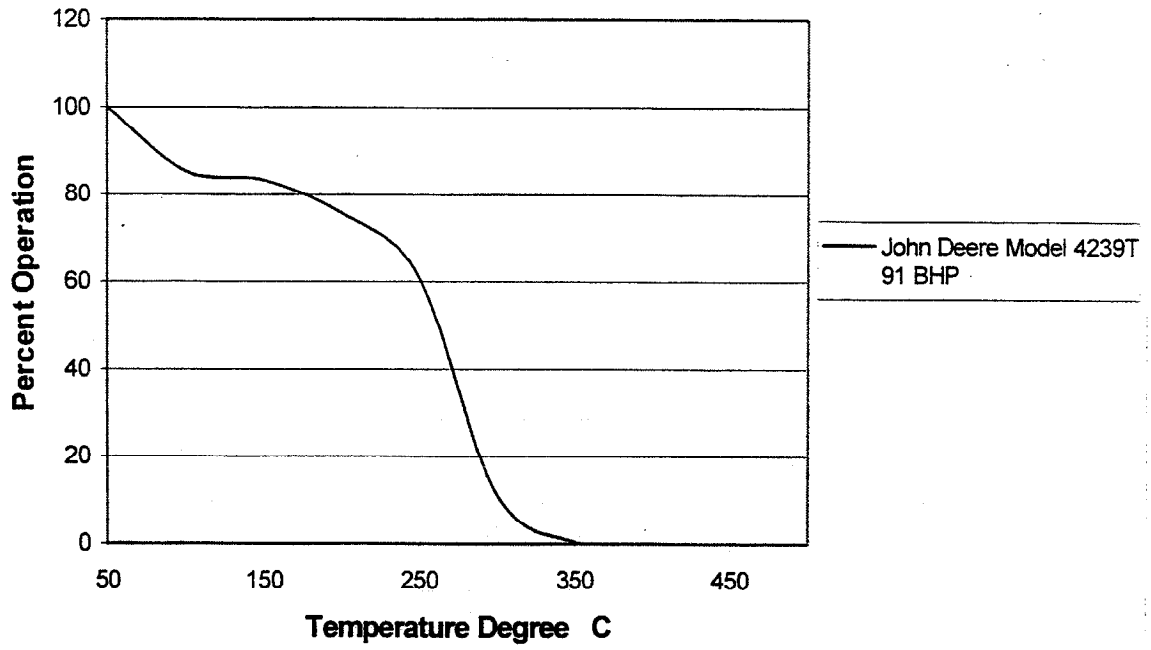
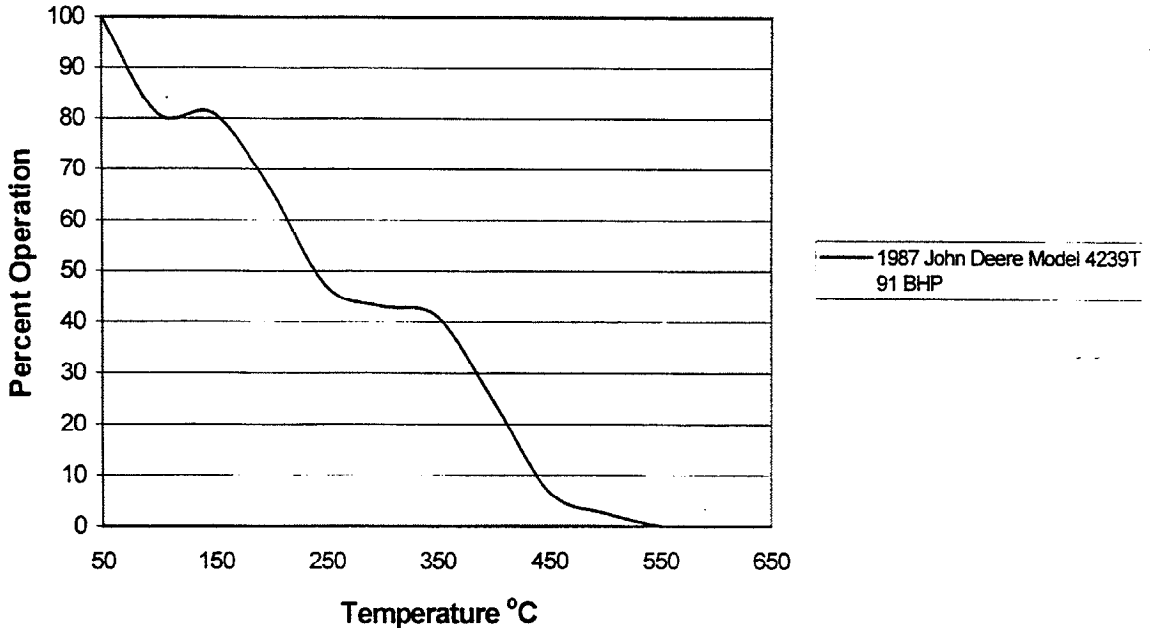


Figure 37: Cecert 1 Exhaust Temperatures Profile
Application: Paint Striper Compressor



1070

Figure 38: Cecert 11 Exhaust Temperature Profile
Application: Paint Striper Compressor

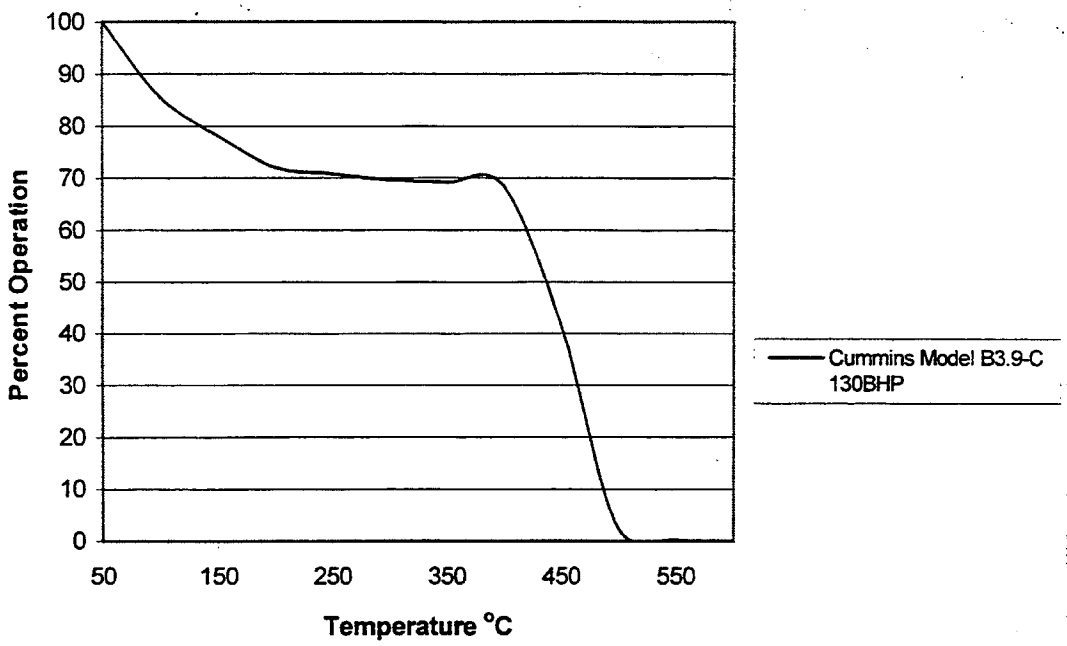


Figure 39: Cecert 22 Exhaust Temperature Profile
Application: Paint Striper Compressor

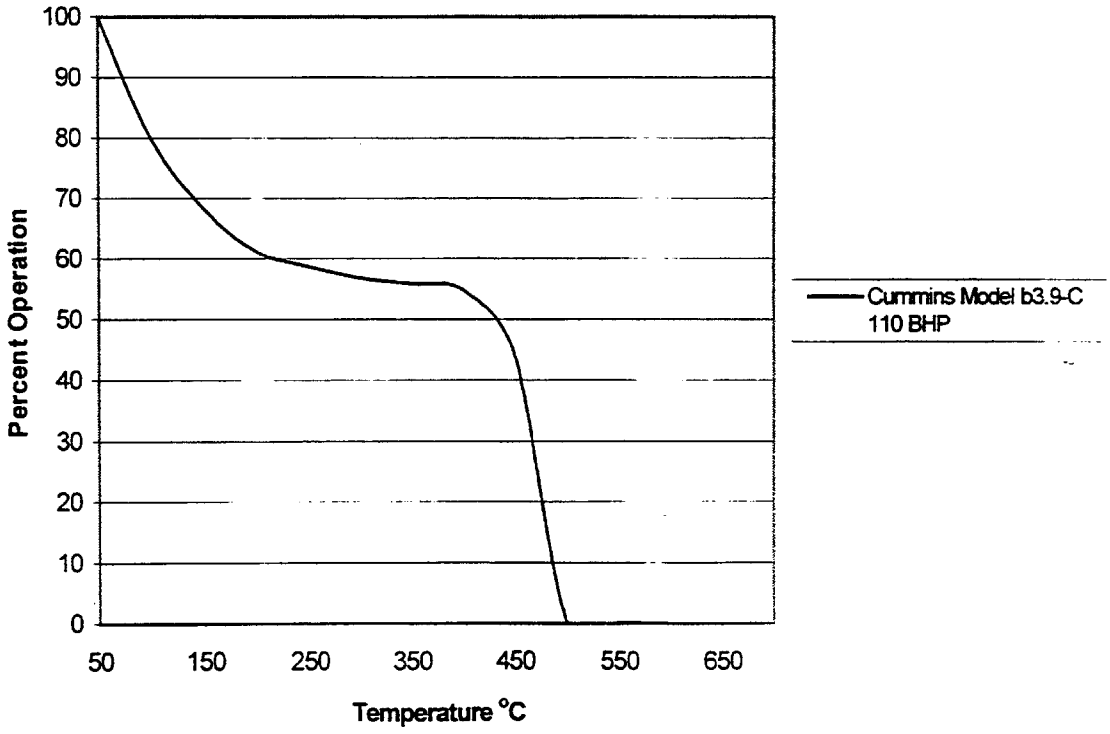


Figure 40: Cecert 3 Exhaust Temperature Profile
Application: Paint Striper Compressor

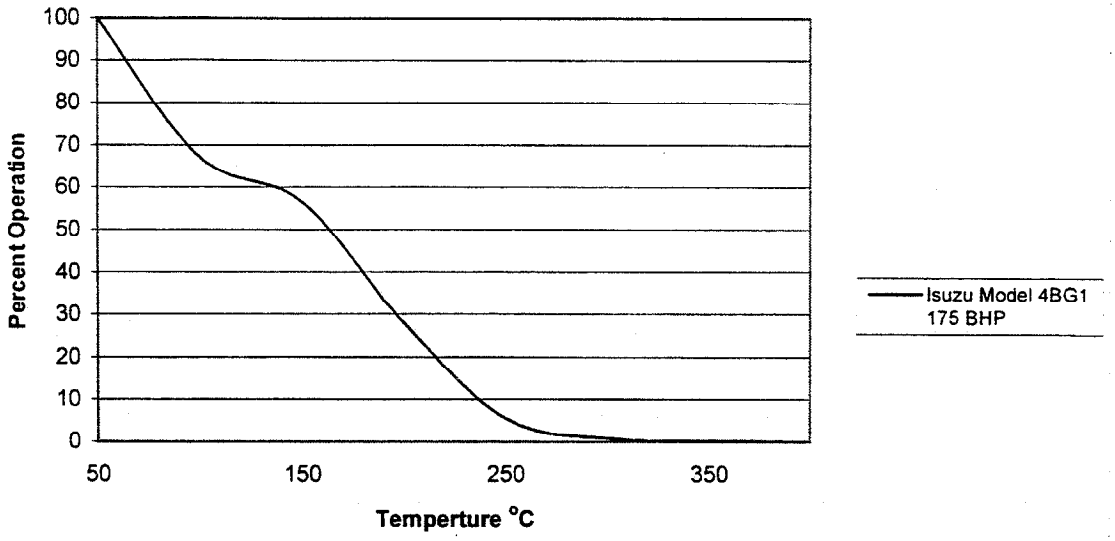
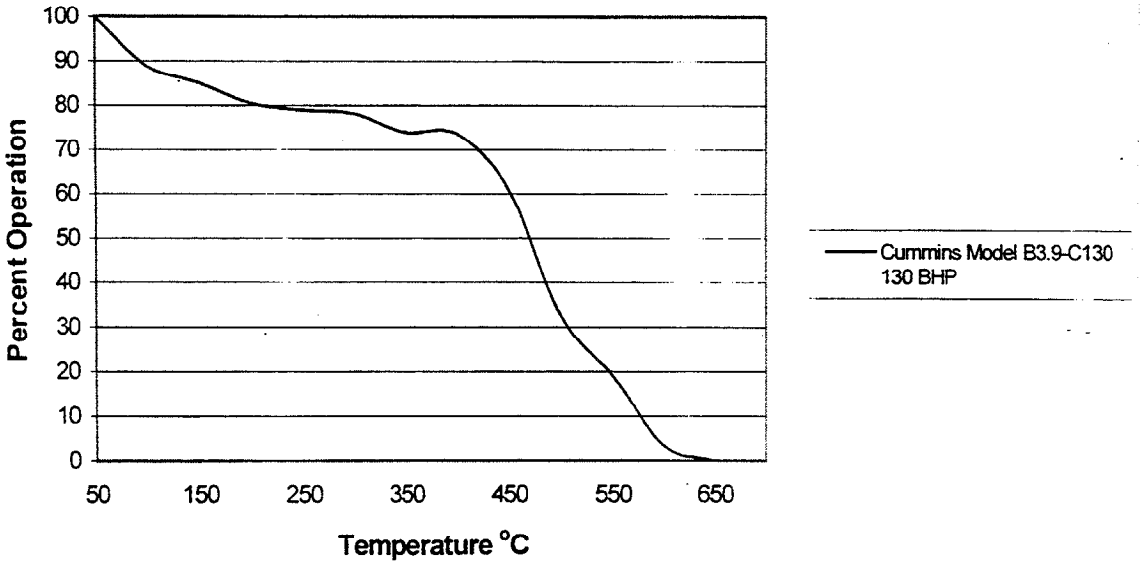


Figure 41: Cecert 4 Exhaust Temperature Profile
Application: Paint Striper Compressor



Compressors

Figure 42: Cecert 15 Exhaust Temperature Profile
Application: Compressor

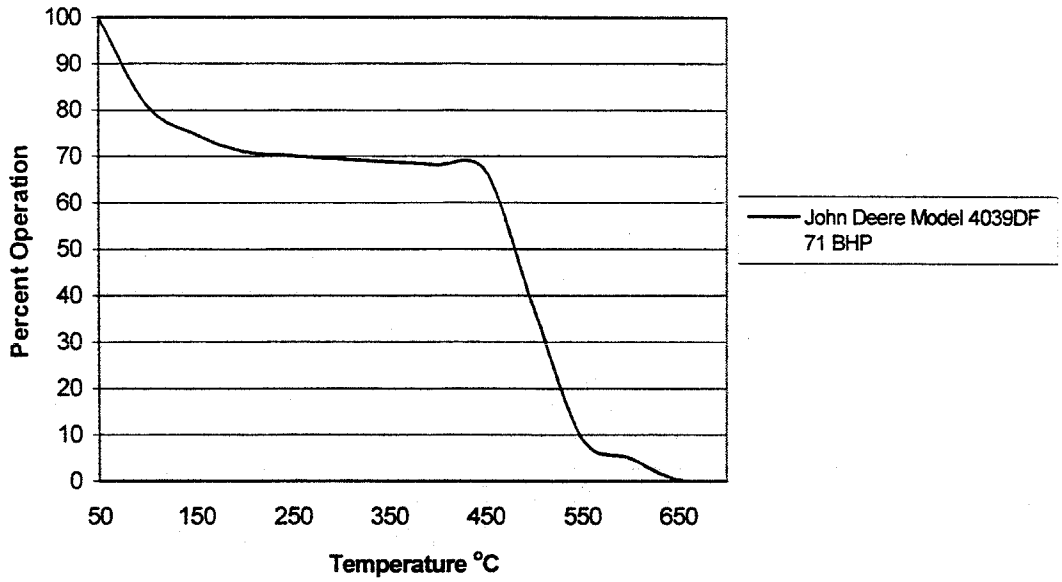


Figure 43: Cecert 2 Exhaust Temperature Profile
Application: Post Hole Digger Compressor

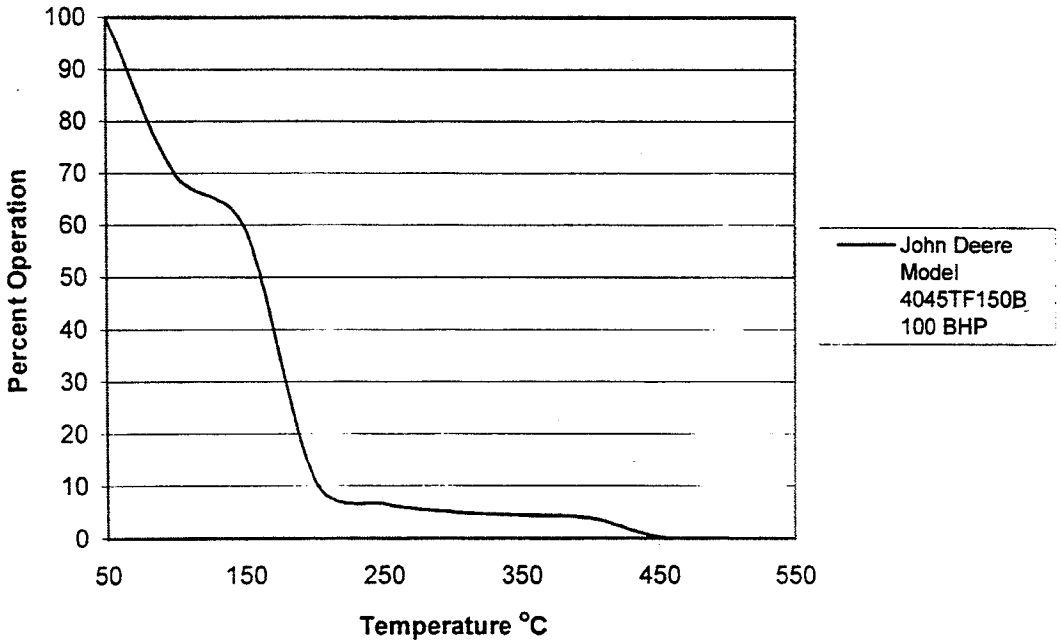


Figure 44: Cecert 25 Exhaust Temperatur Profile
Application: Compressor

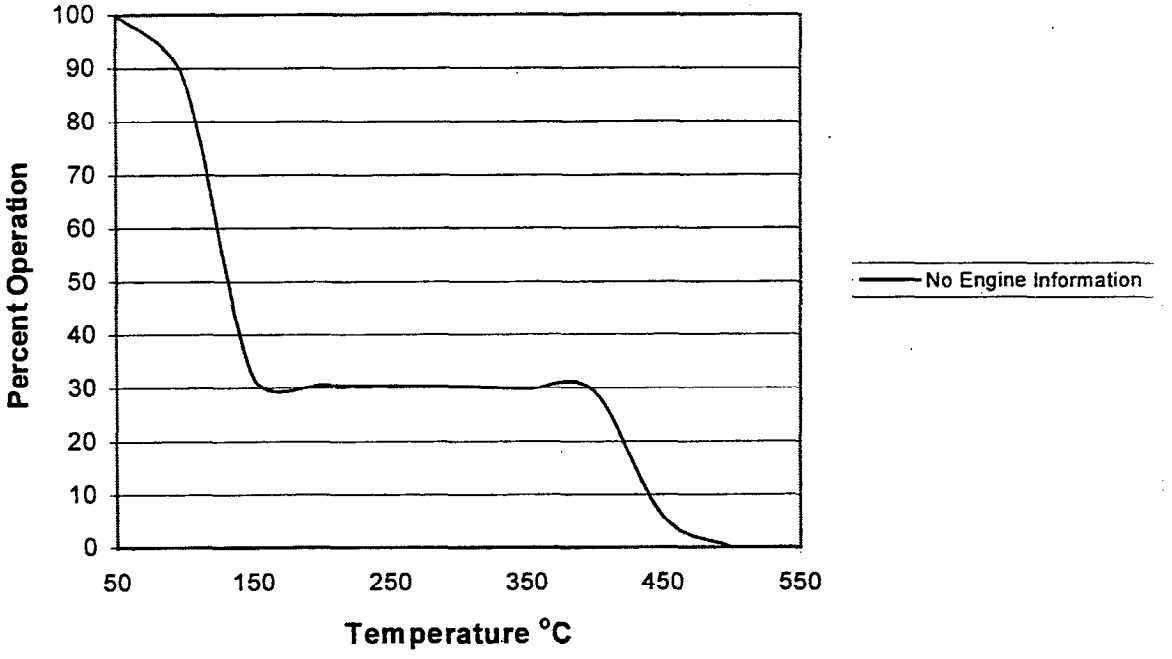


Figure 45: 2714006 Exhaust Temperature Profile
Application: Compressor

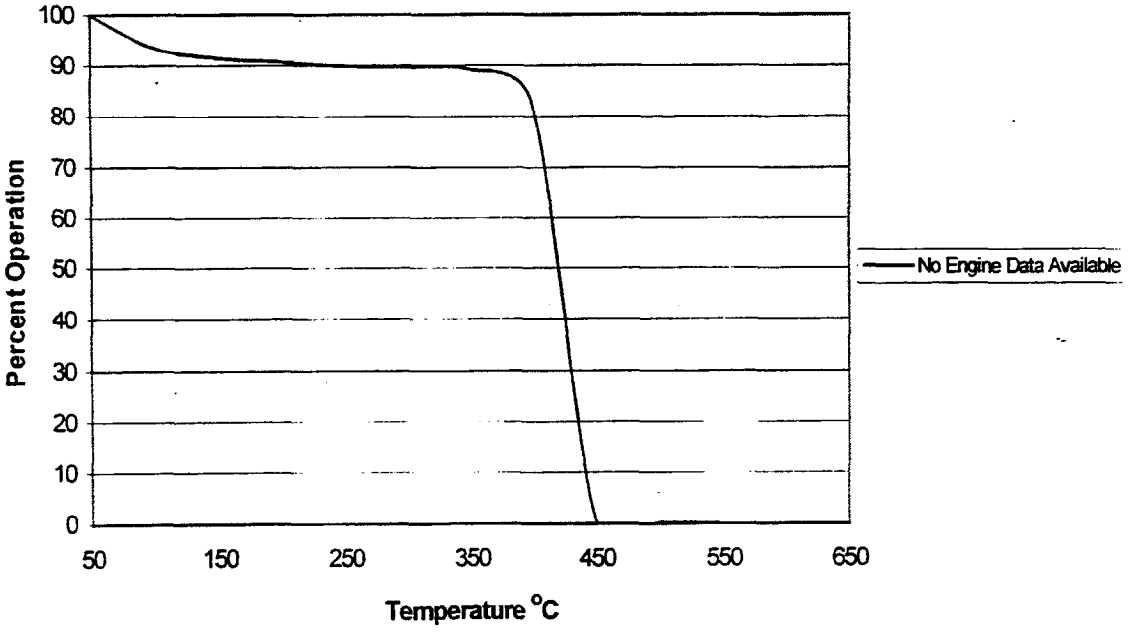


Figure 46: 2715368 Exhaust Temperature Profile
Application: Compressor

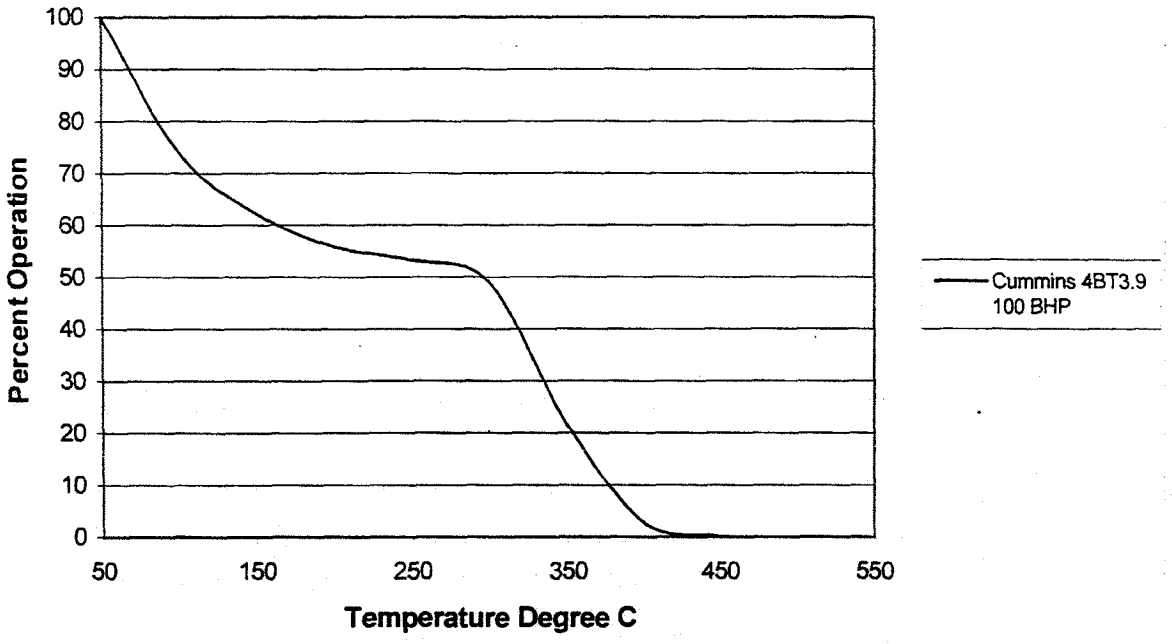


Figure 47: 2716020 Exhaust Temperature Profile
Application: Compressor

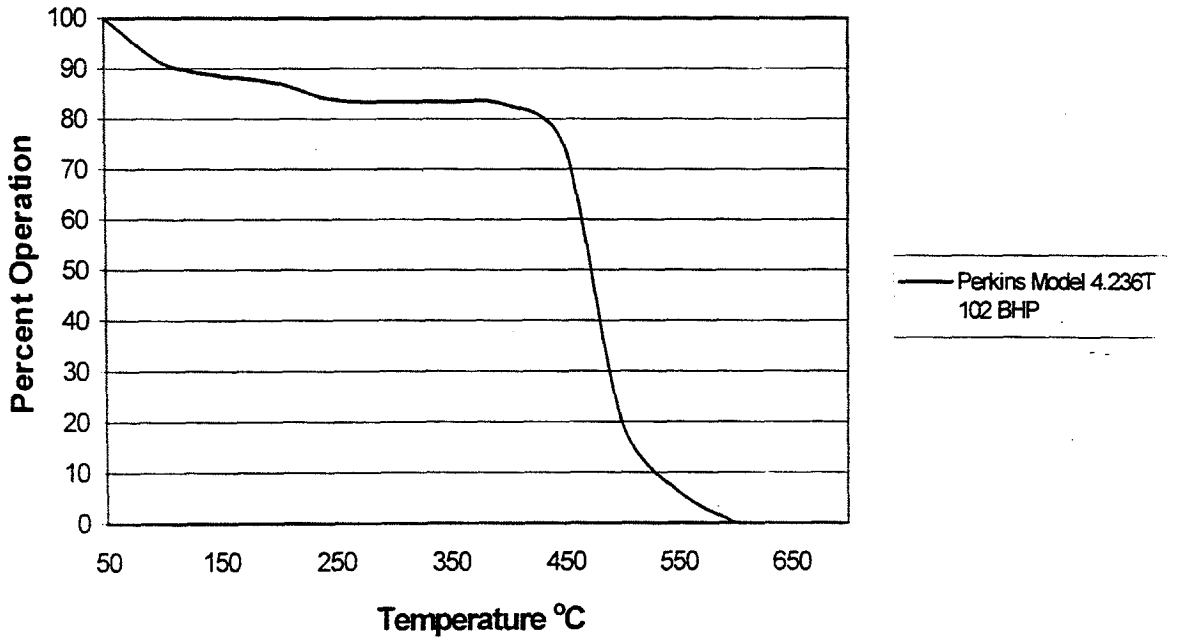


Figure 48: Cecert 45 Exhaust Temperature Profile
Application: Compressor

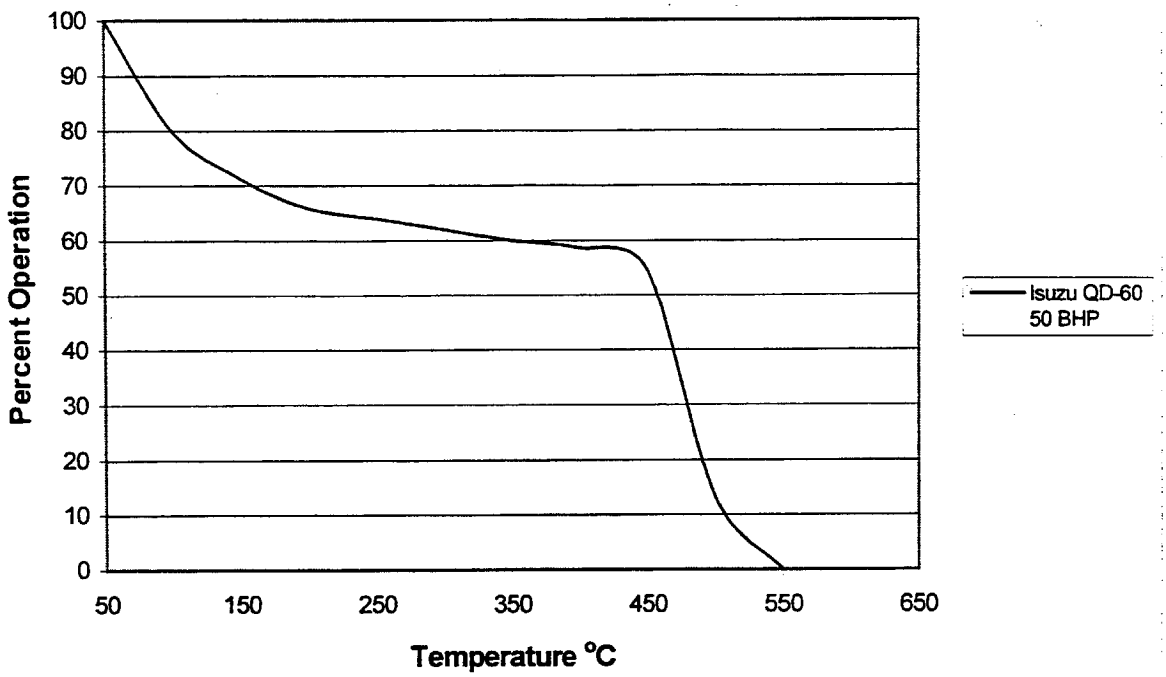


Figure 49: Cecert 8 Exhaust Temperature Profile
Application: Compressor

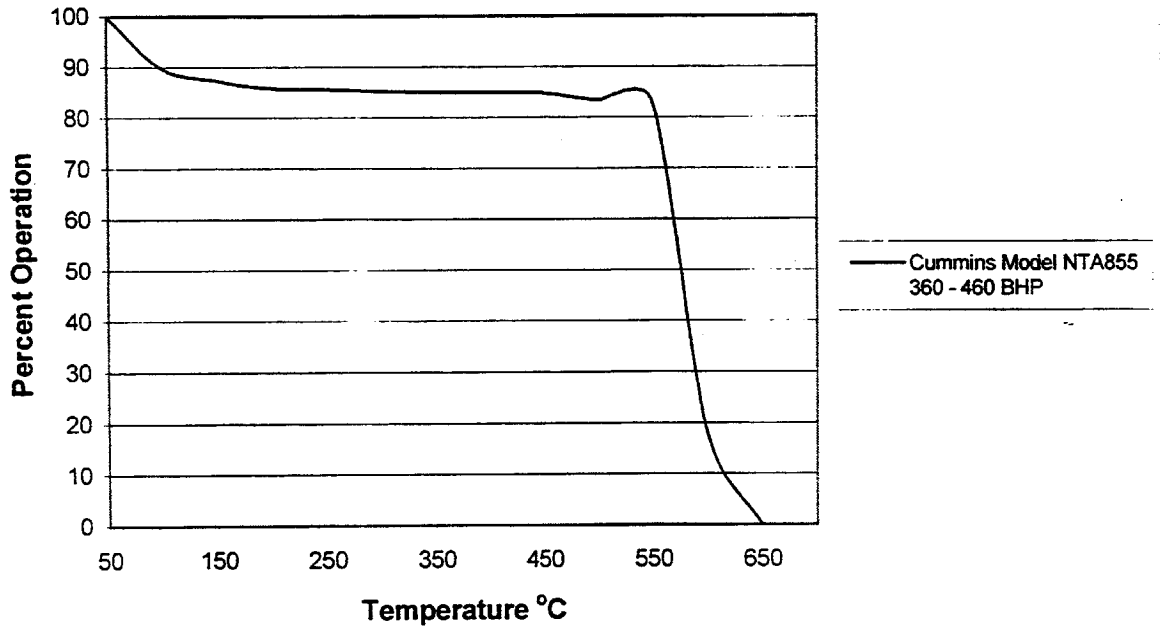
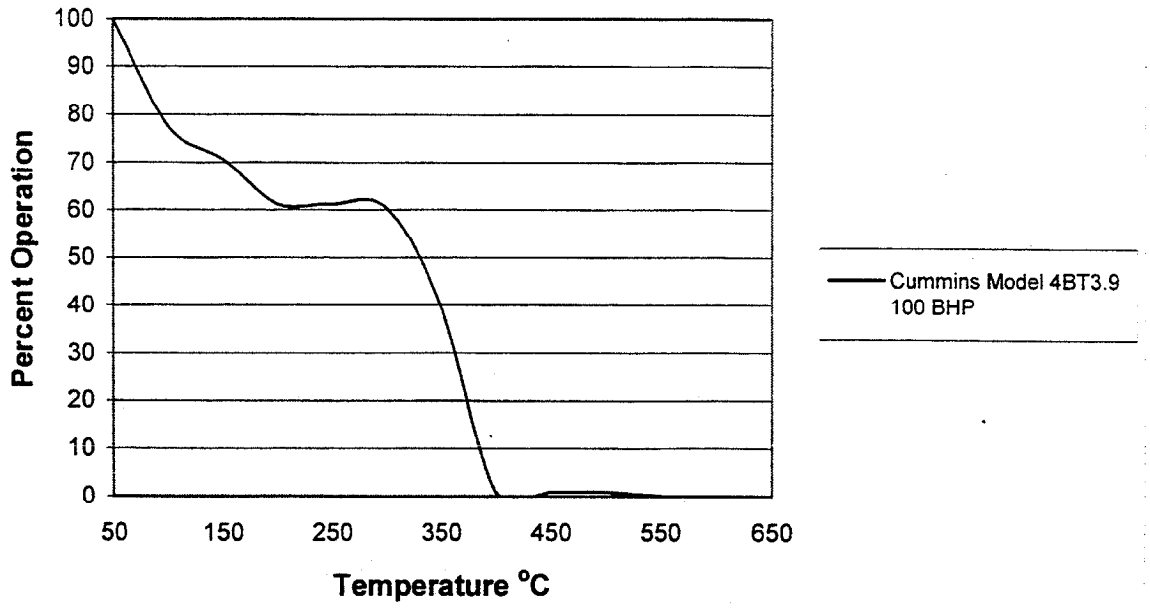


Figure 50: Cecert 9 Exhaust Temperature Profile
Application: Compressor



Pumps

Figure 51: 107393 Exhaust Temperature Profile
Application: Water Pump

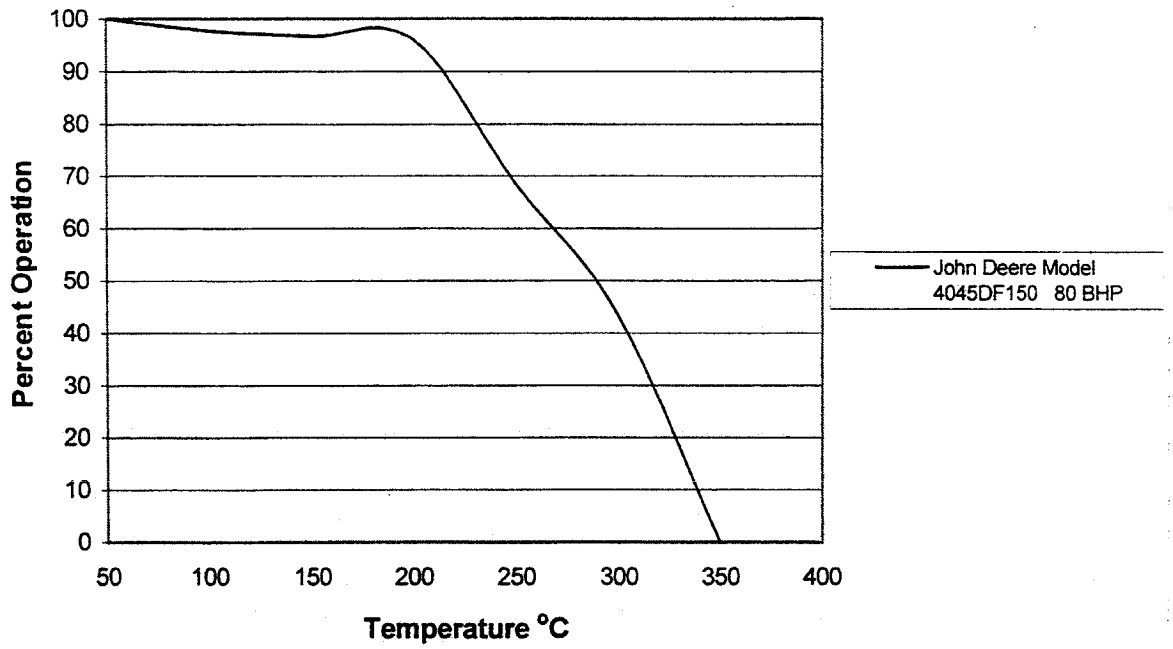


Figure 52: Cecert 19 Exhaust Temperature Profile
Appication: Water Pump

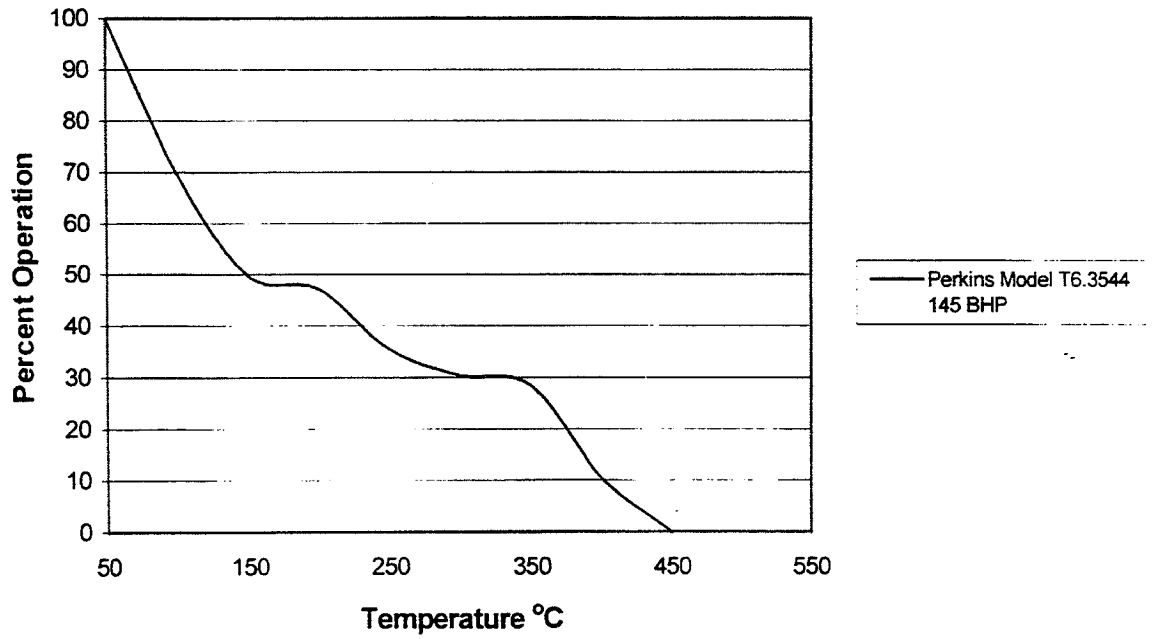


Figure 53: Cecert 20 Exhaust Temperature Profile
Application: Water Pump

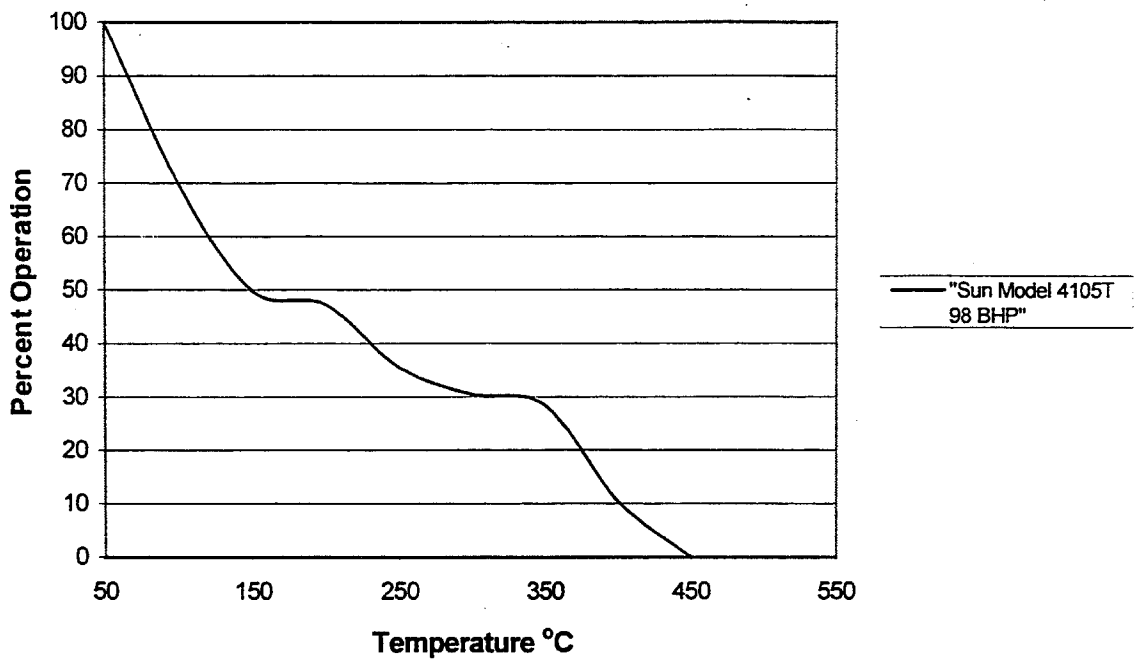


Figure 54: Cecert 21 Exhaust Temperature Profile
Application: Water Pump

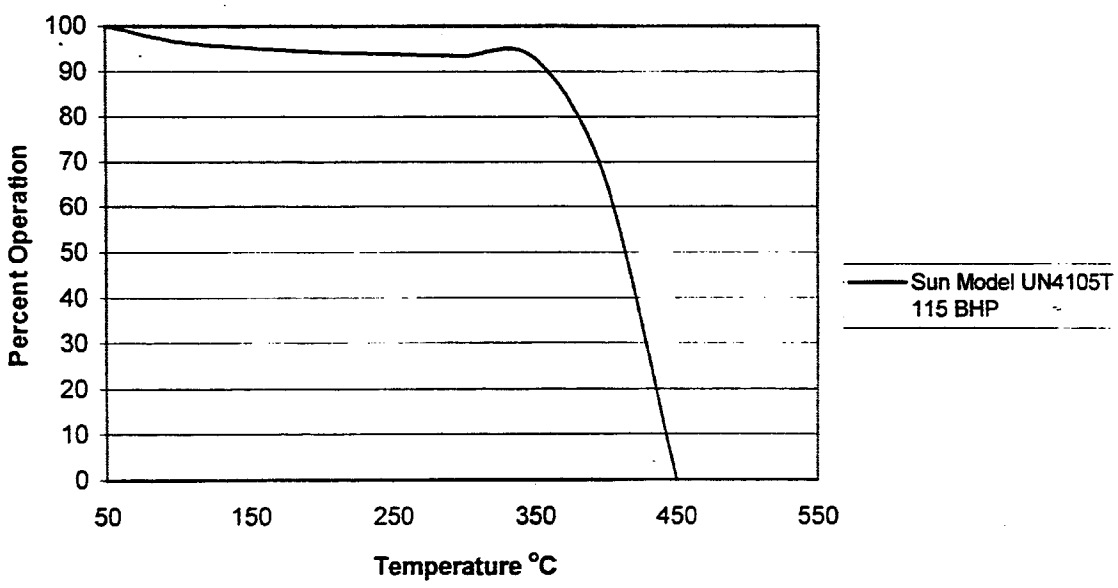


Figure 55: Cecert 31 Exhaust Temperature Profile
Application: Water Pump

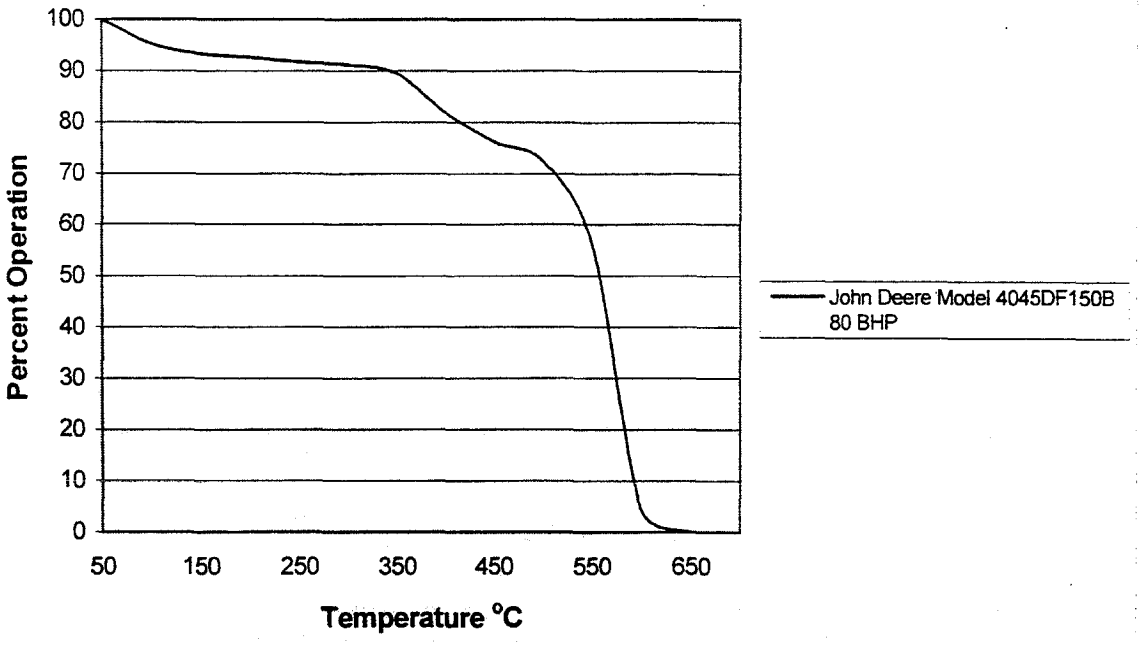


Figure 56: Cecert 47 Exhaust Temperature Profile
Application: Production Pump

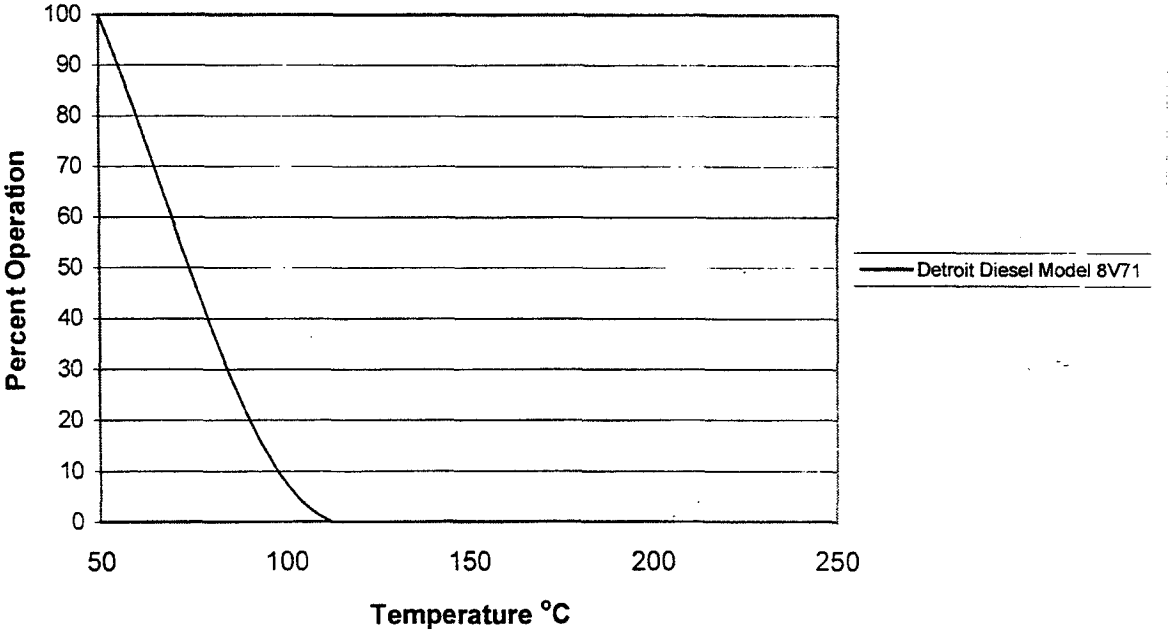


Figure 57: R38 Exhaust Temperature Profile
Application: Drilling Rig Pump

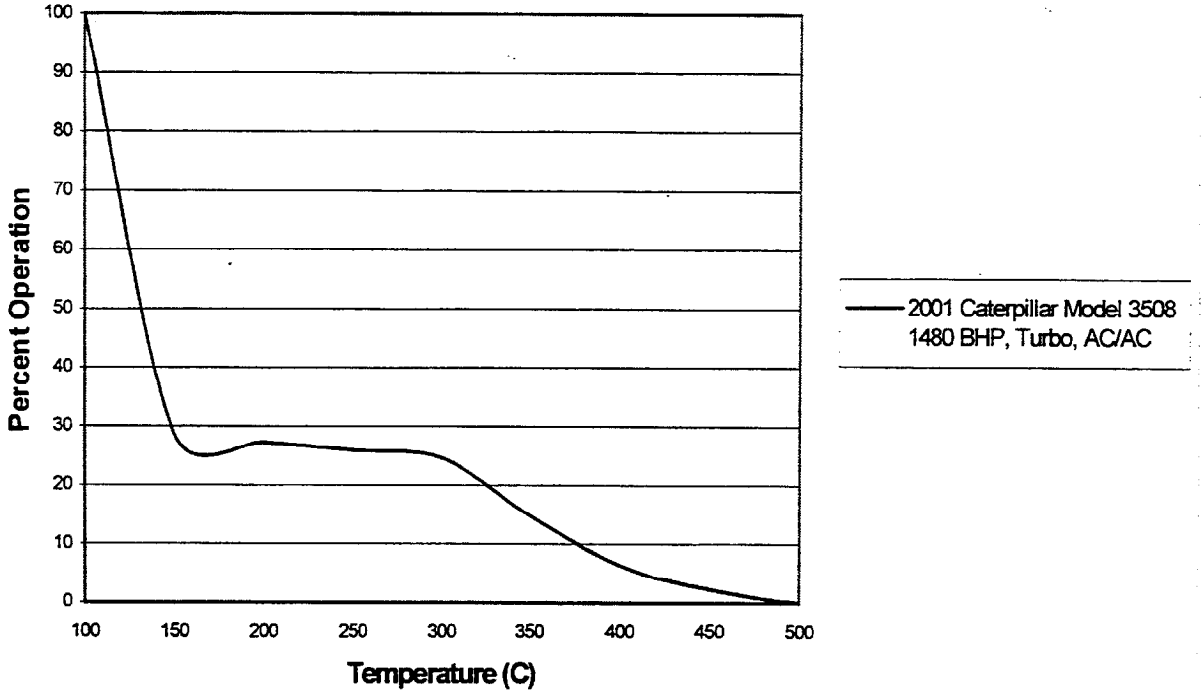


Figure 58: R38 Exhaust Temperature Profile
Application: Drilling Rig Pump

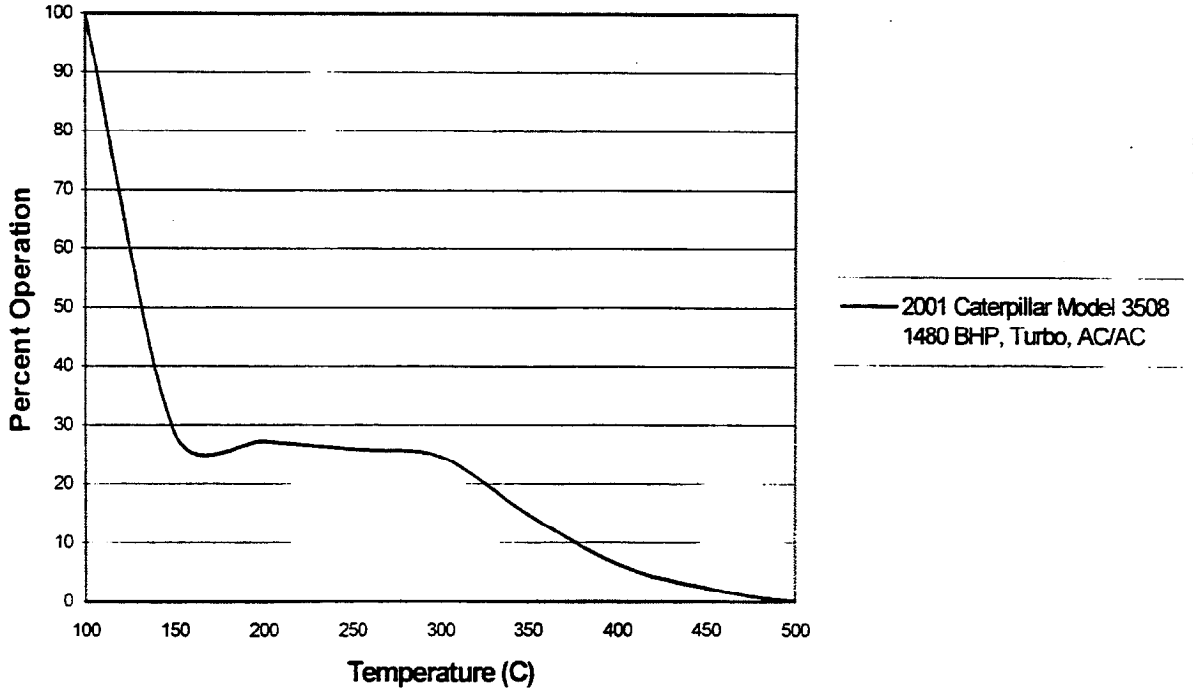


Figure 59: R38 Exhaust Temperature Profile
Application: Drilling Rig Pump

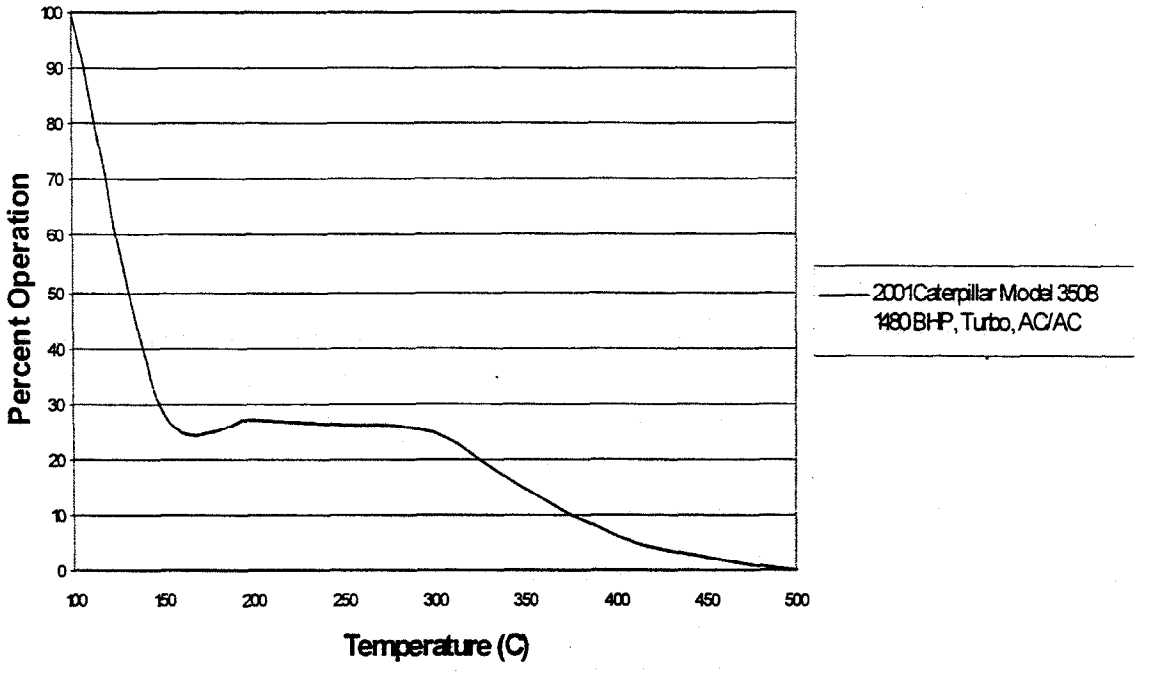
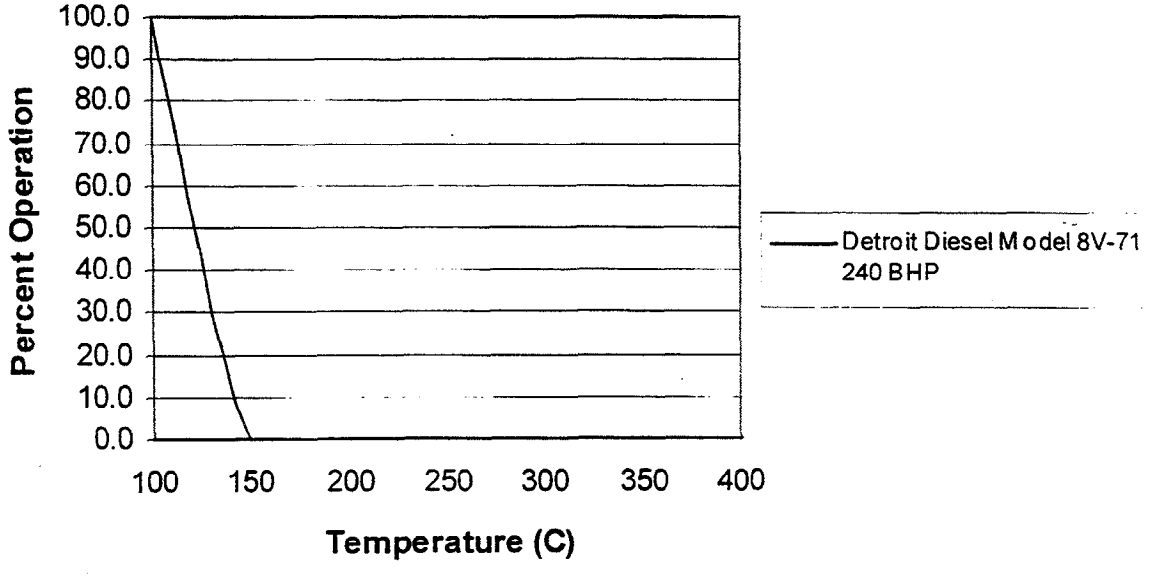


Figure 60: 108758 Engine Exhaust Temperature
Application: Drilling Pump



Grinders

Figure 61: 116369 Exhaust Temperature Profile
Application: Horizontal Grinder

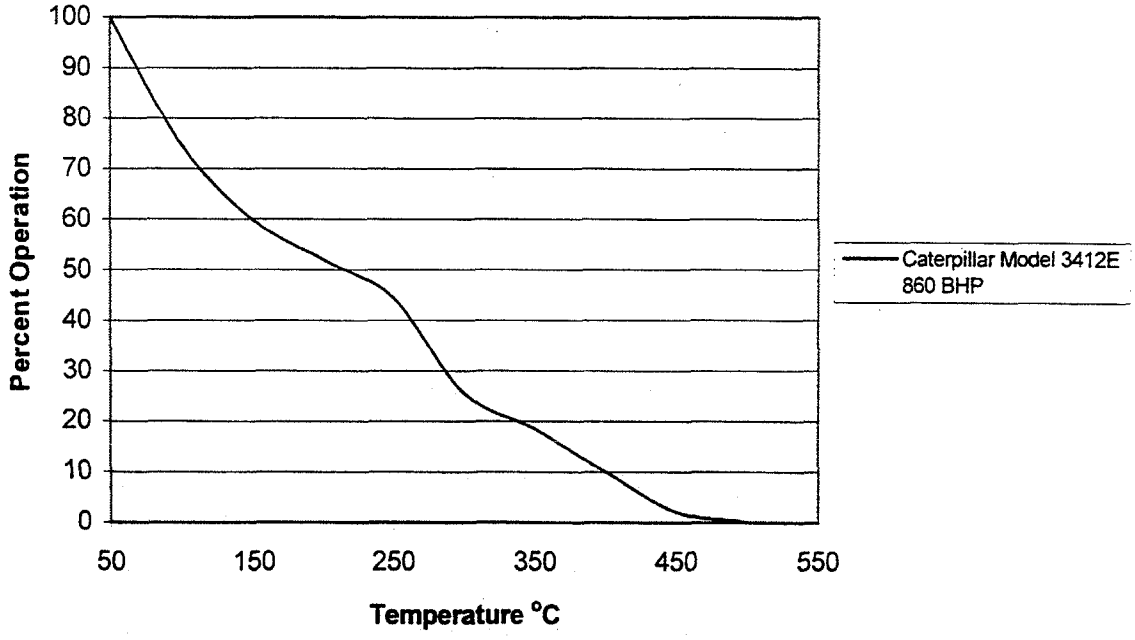
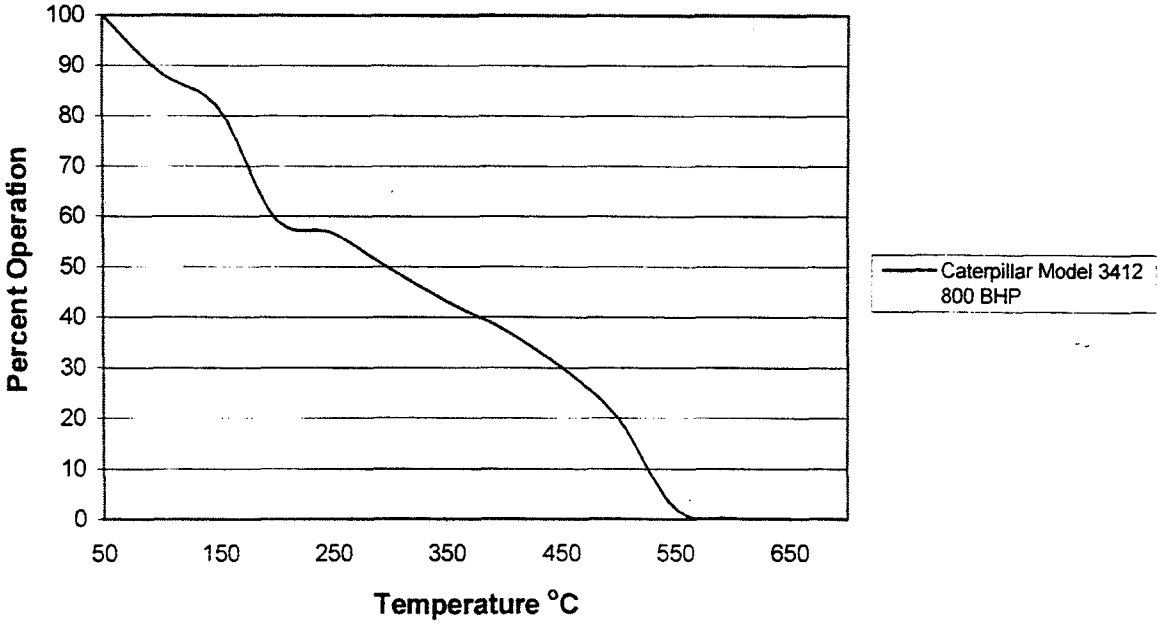


Figure 62: Cecert 41 Exhaust Temperature Profile
Application: Grinder



Grader/Shovels

Figure 63: Cecert 35 Exhaust Temperature Profile
Application: Grader Shovel

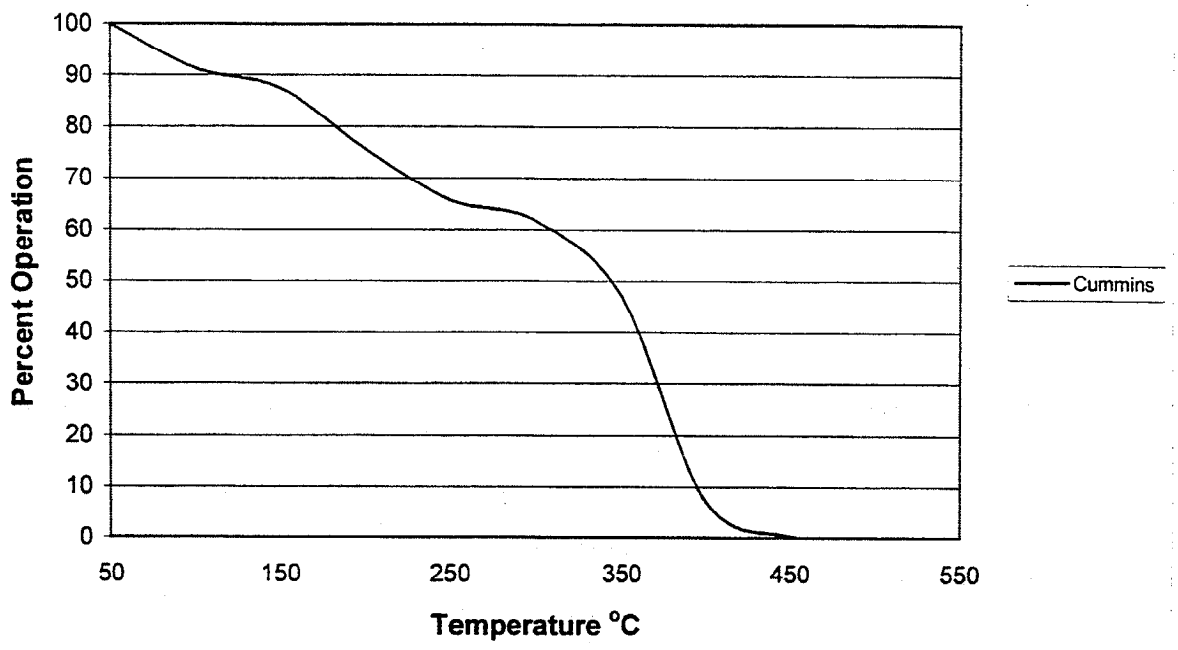
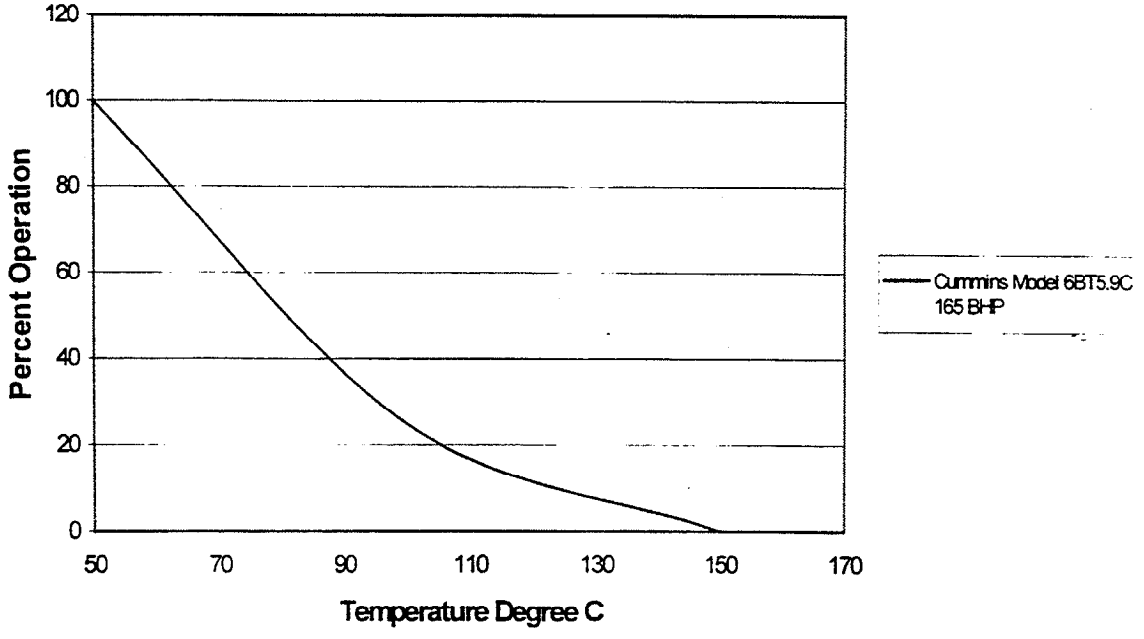
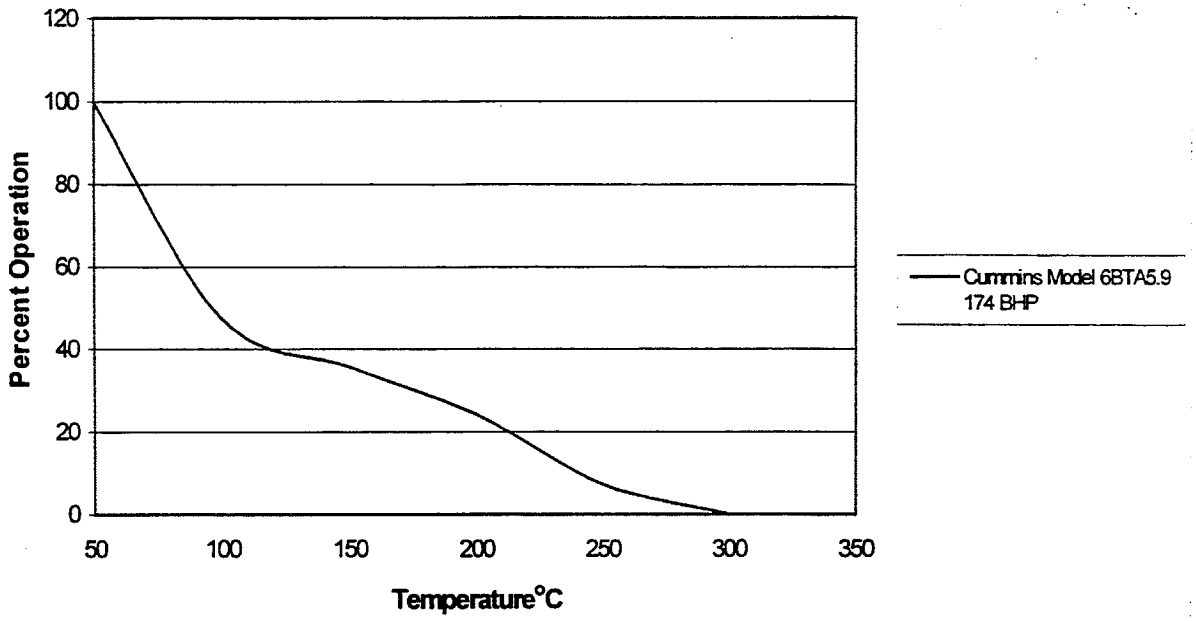


Figure 64: Cecert 40 Exhaust Temperature Profile
Application: Grader



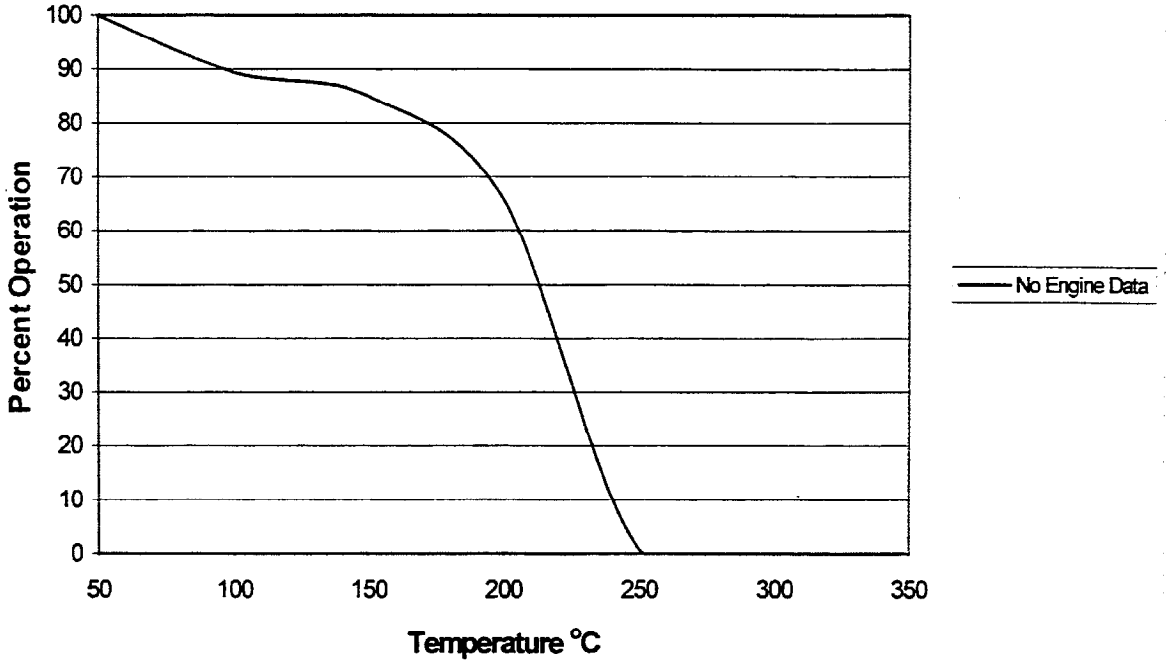
1088

Figure 65: Cecert 6 Exhaust Temperature Profile
Application: Shovel



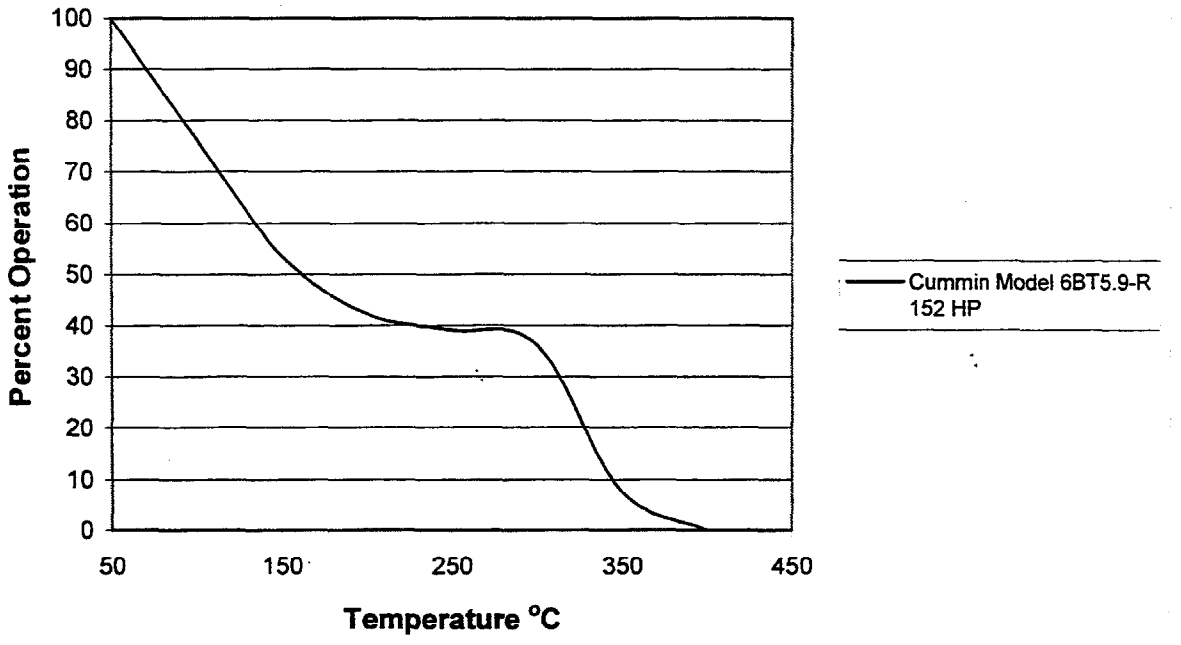
Welder

Figure 66: Cecert 44 Exhaust Temperature Profile
Application: Welder



Crane

Figure 67: Cecert 39 Exhaust Temperature Profile
Application: Crane



Jet Washers

Figure 68: Cecert 46 Exhaust Temperature Profile
Application: Drilling Jet Washer

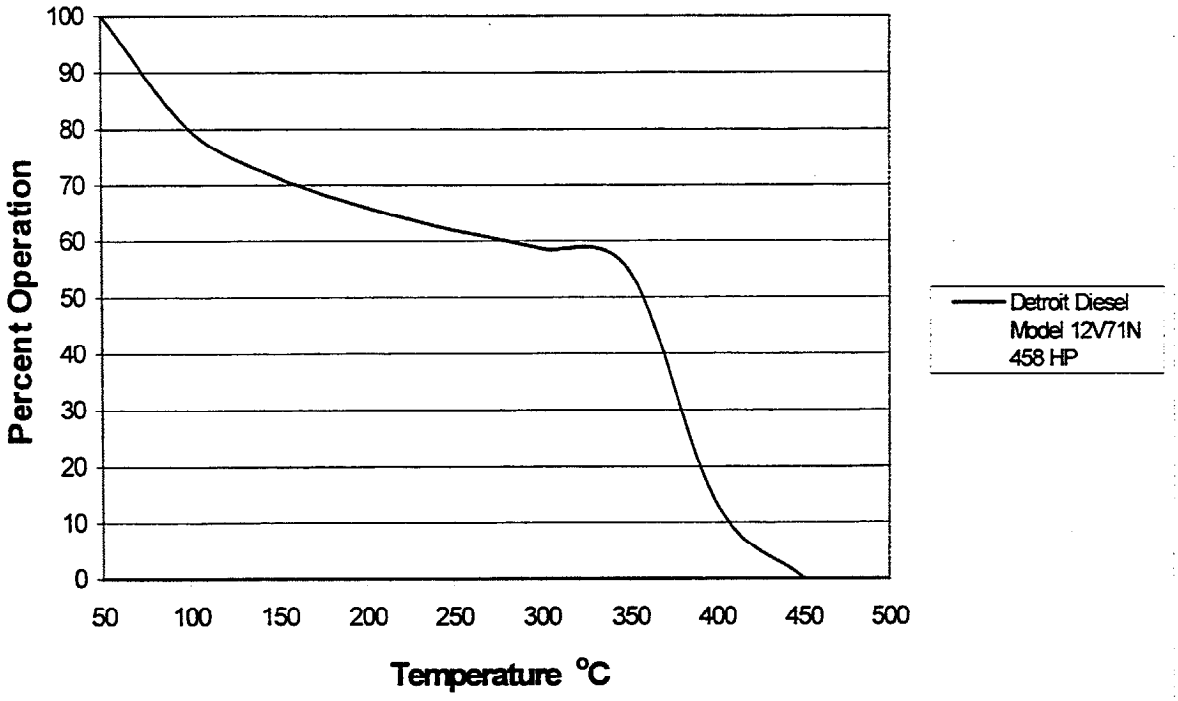


Figure 69: 107824 Engine Exhaust Temperature Profile
Application: Jet Washer

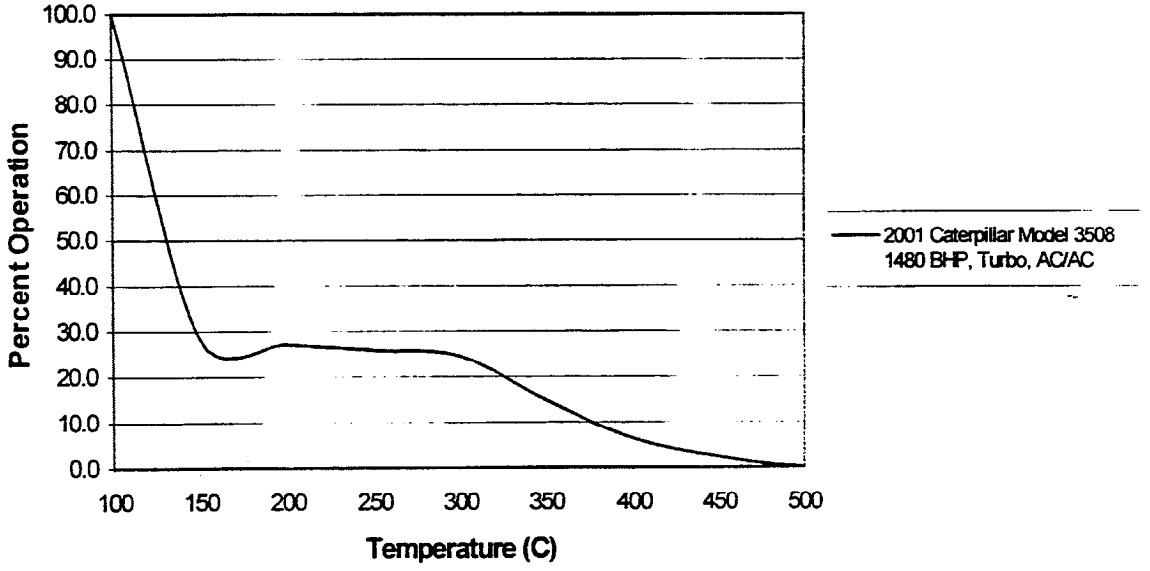
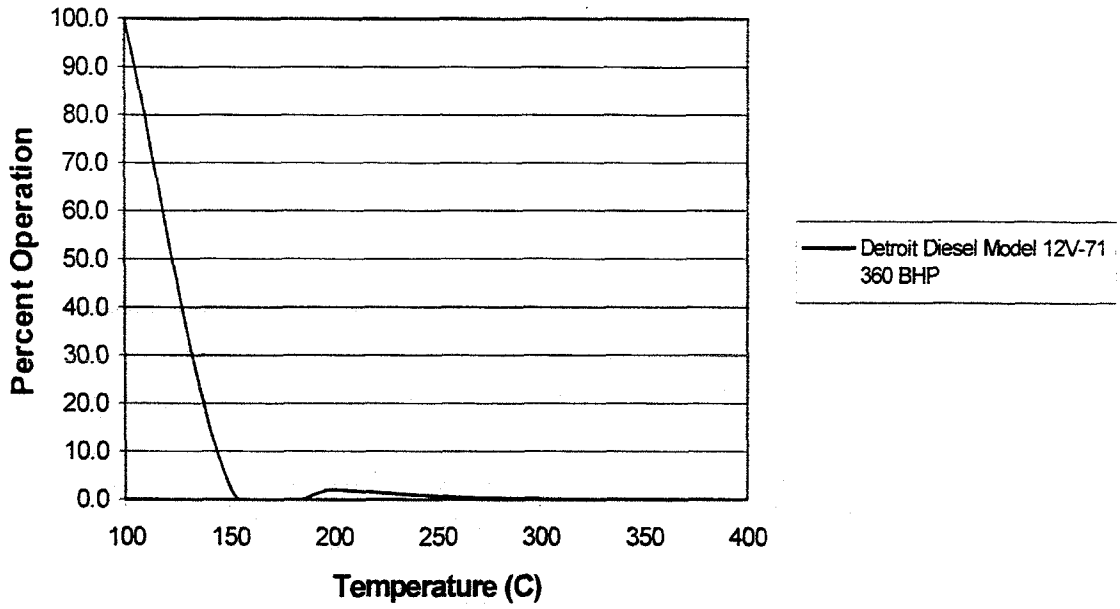


Figure 70: 107822 Engine Exhaust Temperature Profile
Application: Jet Washer



Drilling Rigs

Figure 71: 106222 Engine Temperature Profile
Application: Drilling Rig

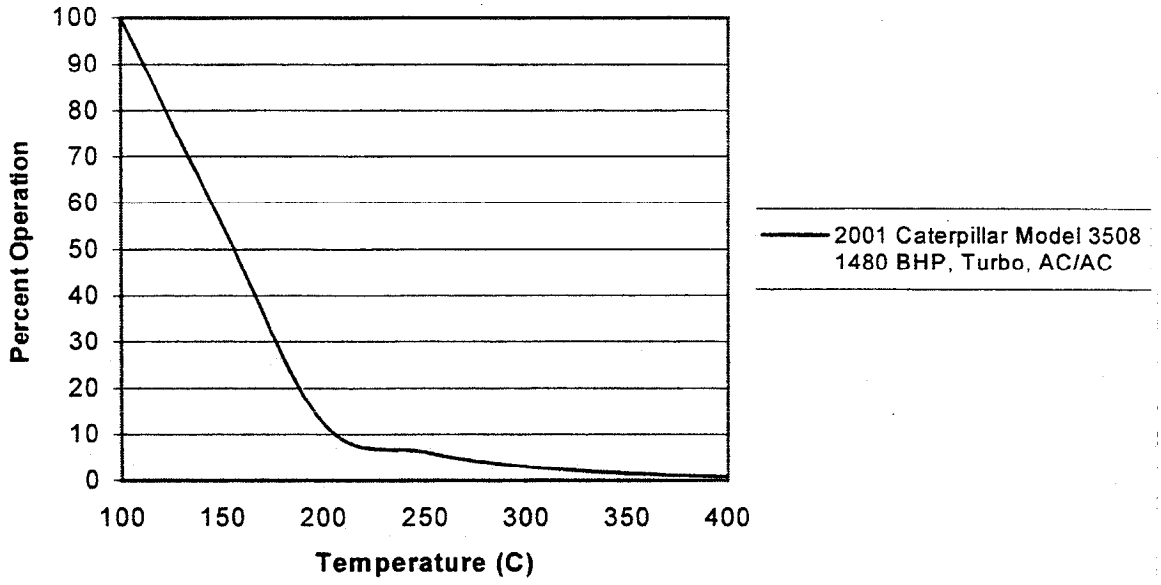
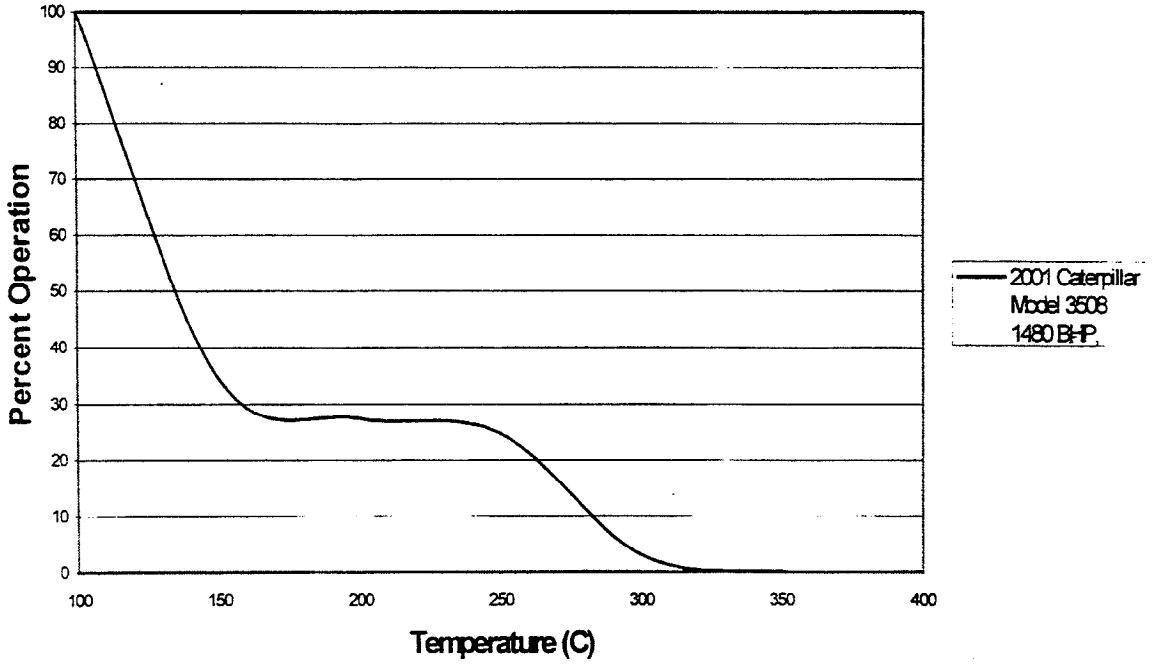


Figure 72: 115176 Engine Exhaust Temperature Profile
Application: Top Head Drive Rig



Clamshell Dredge

Figure 73: Cecert 53 Exhaust Temperature Profile
Application: Clamshell Dredge

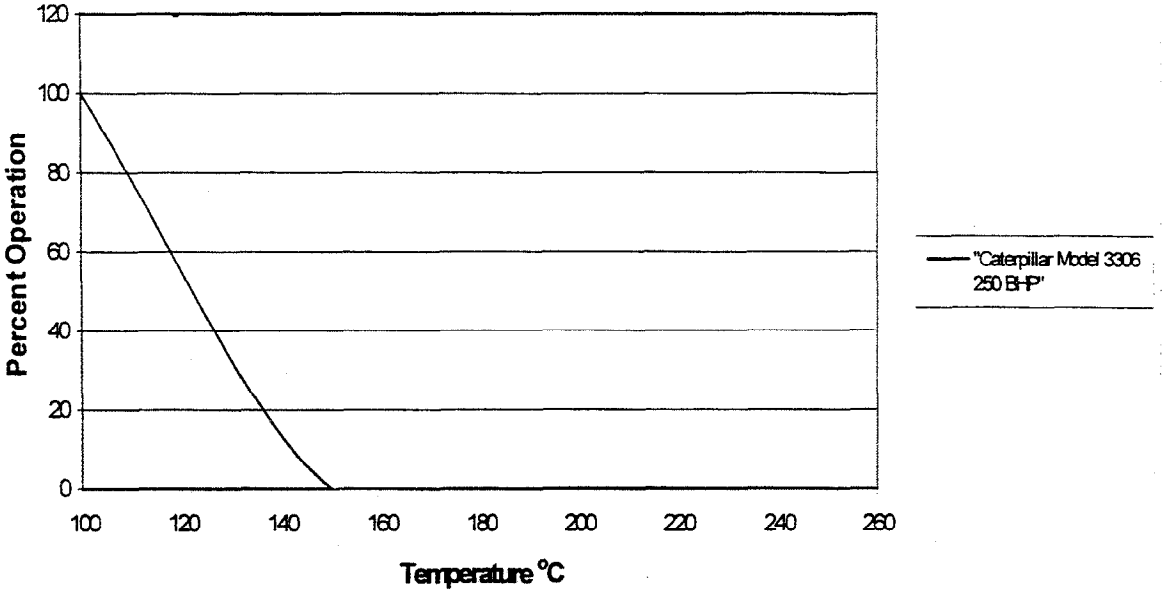
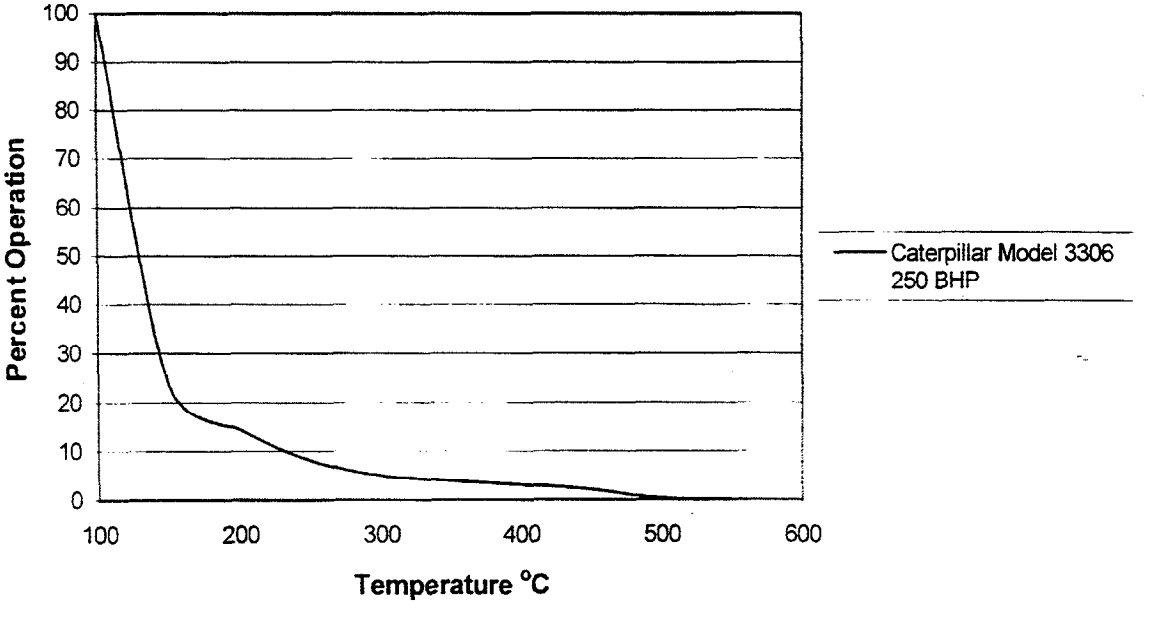
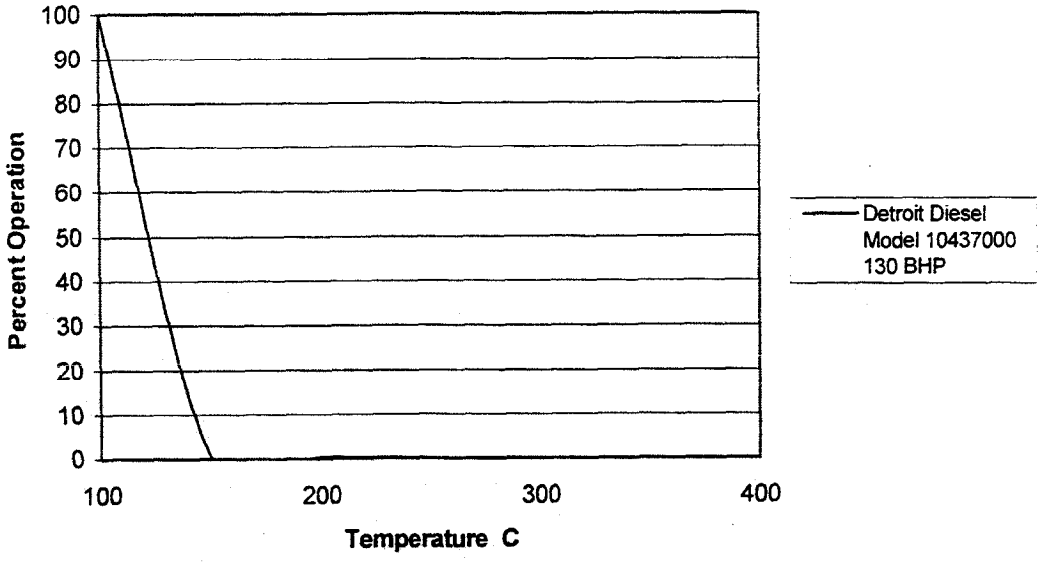


Figure 74: Cecert 52 Exhaust Temperature Profile
Application: Clamshell Dredger



Bow Anchor Winch

Figure 75: Cecert 50 Exhaust Temperature Profile
Application: Bow Anchor Winch



Vacuum Pumps

Figure 76: Cecert 10 Exhaust Temperature Profile
Application: Vacuum Pump

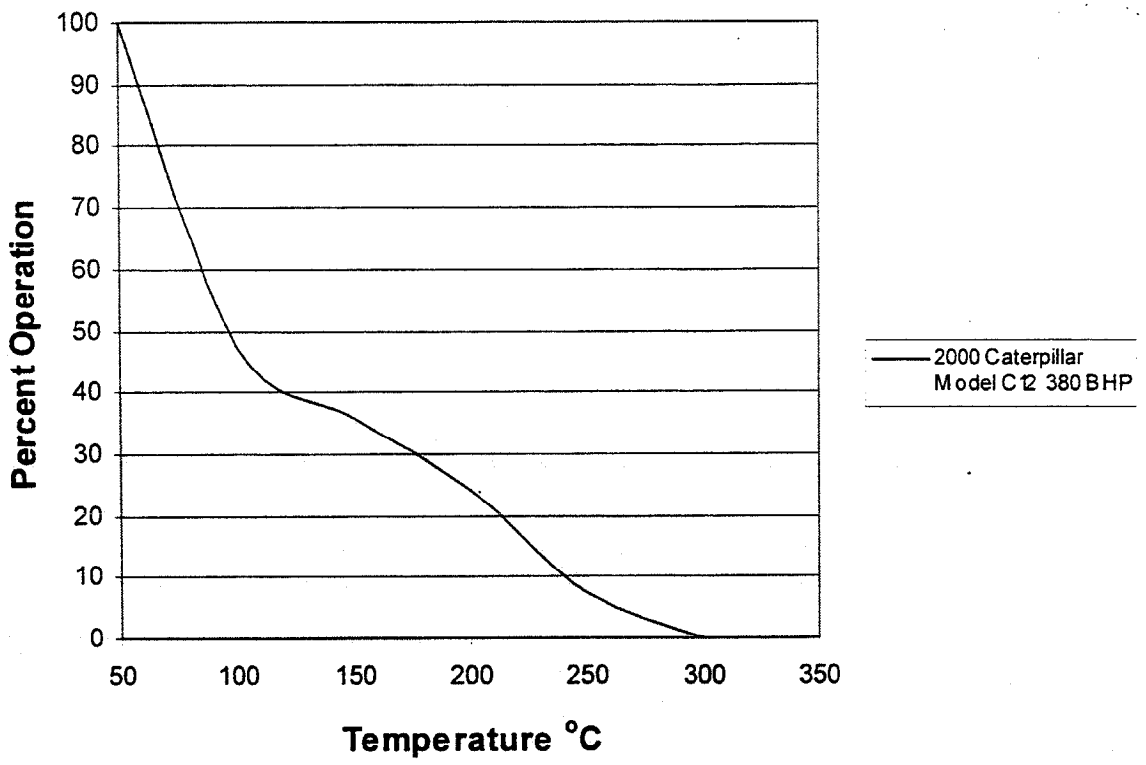


Figure 77:Cecert 12 Exhaust Temperature Profile
Application: Vacuum Pump

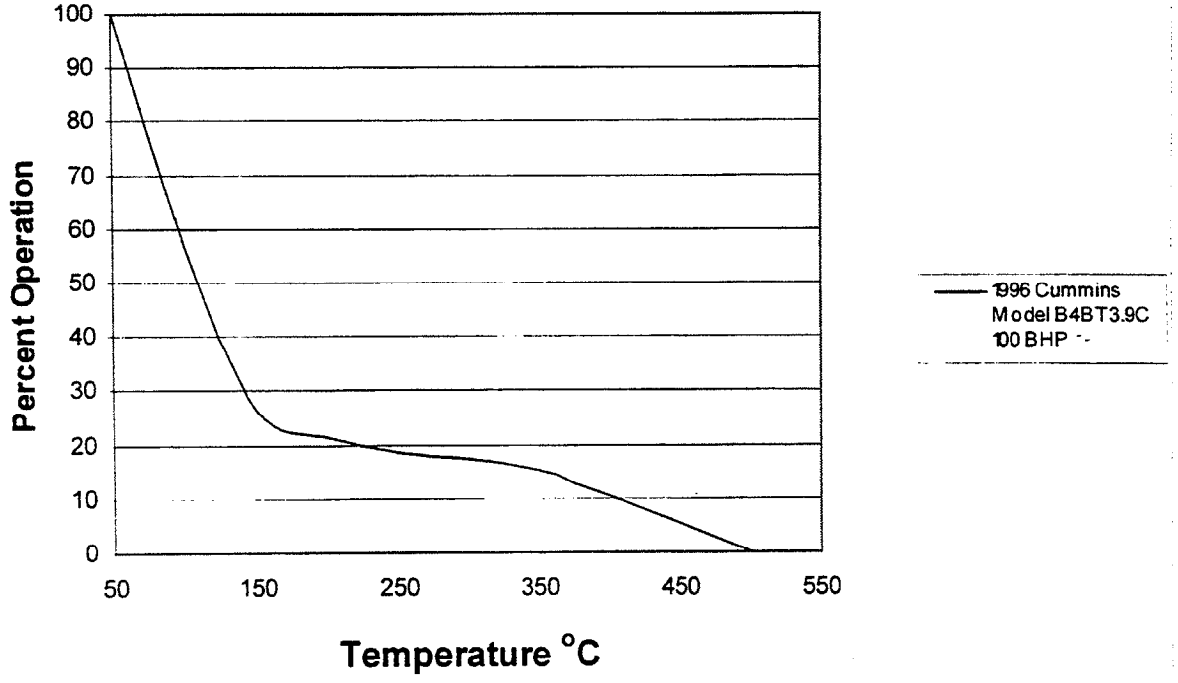


Figure 78: Cecert 13 Exhaust Temperature Profile
Application: Vacuum Pump

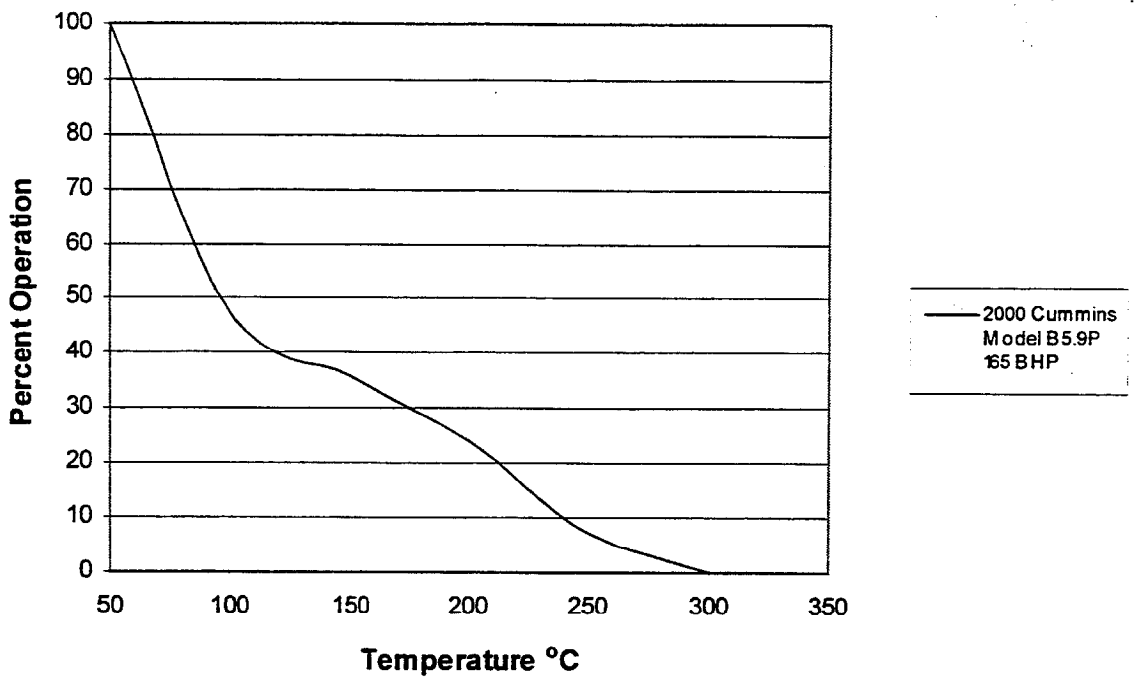


Figure 79: Cecert 5 Exhaust Temperature Profile
Application: Vacuum Pump

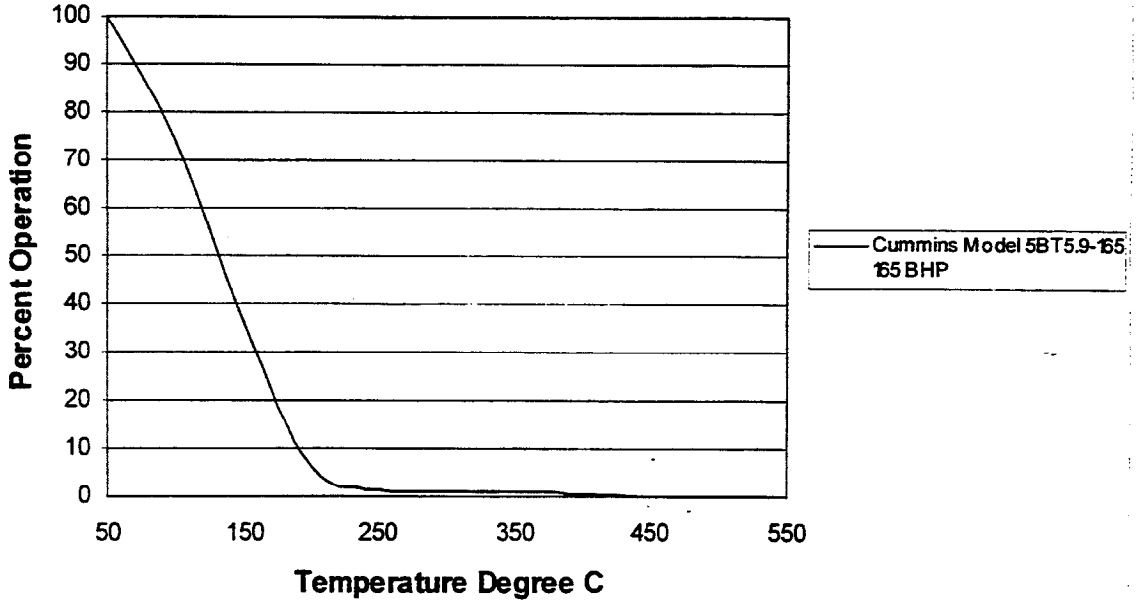
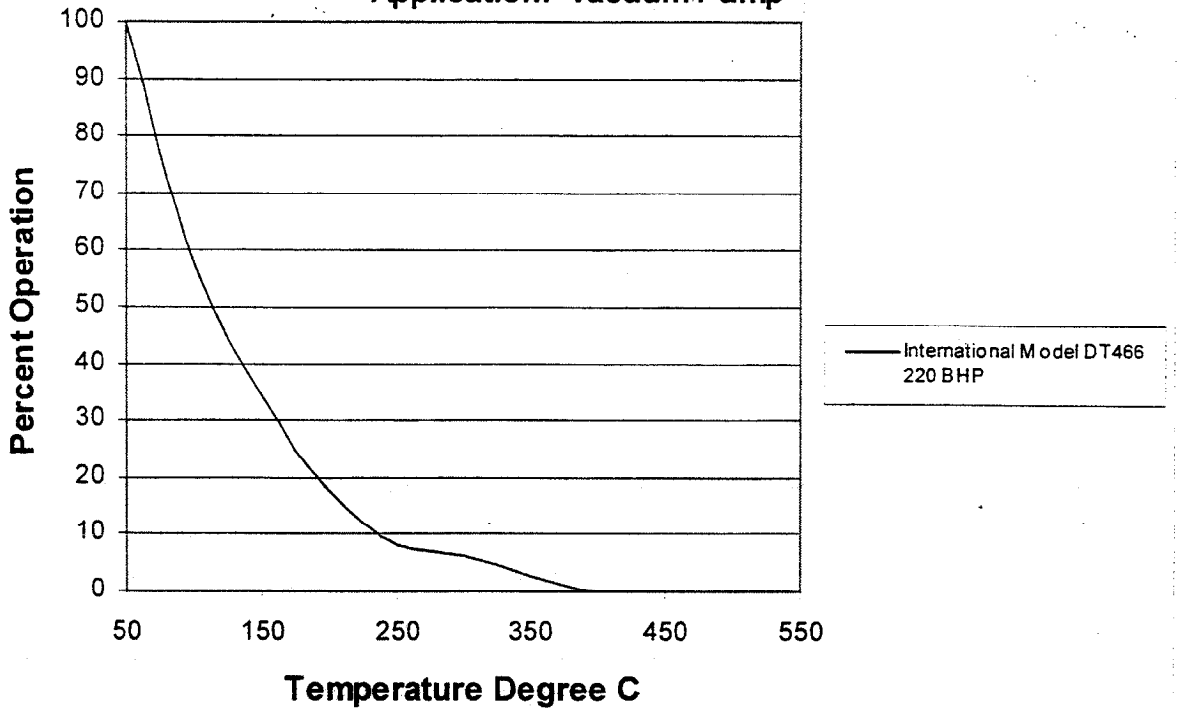


Figure 80: Cecert 7 Exhaust TemperatureProfile
Application: Vacuum Pump



Appendix G

Economic Impact Analysis Methodology

Economic Impact Analysis Methodology

The major factors affecting the economic impact of the proposed ATCM are: (1) the number and characteristics of engines affected; (2) changes in the overall portable diesel-fueled engine population due to implementation of the proposed ATCM; (3) the cost and timing of early replacement of engines before the end of their useful life; and (4) the cost and timing associated with the addition of diesel PM control technologies.

Engine Population

Staff estimates that there are 33,000 portable diesel-fueled engines larger than 50 horsepower operating within California. This estimate is based upon the number of engines identified for the year 2000 emissions inventory, with updated information for agricultural irrigation pumps.

Information for engines registered with the Statewide Portable Equipment Registration Program (PERP) and assumptions used for estimating the year 2000 emissions inventory was used to characterized the engines. There are about 14,000 diesel-fueled engines registered with PERP. For each of these engines, the owners registering the engines were required to provide the following information as part of the application for registration: the size of the engine based upon horsepower rating, age of the engine, and application description for the engine (for example, the engine was used to power a compressor). In addition, emissions were estimated using operating hours that were used to establish the 2000 inventory.

Because permits have not been required for agricultural activities, there is limited information regarding the use of agricultural irrigation pumps. Staff relied on information provided by local district staff as well as data collected for the Carl Moyer Program. Based upon these information sources, staff assumed that the average irrigation pump is 99 horsepower and operates about 1,000 hours annually.

For the other 16,000 engines, information for engines registered with PERP was used to characterize these engines. All the engines registered in PERP, as a whole, are probably not reflective of all the portable diesel-fueled engines that operate in California. PERP is more heavily populated with engines associated with the rental, oil-well services, and marine construction industries. The rental industry has the newest fleets in California, while both the oil-well services and marine construction industries use very large engines that tend to comprise some of the oldest fleet of portable engines in California. Removing these particular categories of engine applications from PERP, the ARB staff believes that the remaining PERP engines collectively represent the rest of the portable engines in California.

Overview of Impact of Proposed ATCM

The proposed ATCM initially requires all portable diesel-fueled engines to be certified to an emission standard for newly manufactured off-road engines by January 1, 2010. Owners of portable diesel engines will meet with this requirement by replacing any noncertified engines in their fleets with new certified engines. Fleet emission standards then become applicable January 1, 2013 and January 1, 2017, with full compliance by January 1, 2020. These standards are expected to be satisfied by a combination of engine replacement and add-on retrofit technology.

Engines used exclusively in emergency applications or designated as low-use engines are subject to the 2010 requirement, but are not subject to the fleet emission standards. Nevertheless, these engines are required by January 1, 2020, to be either certified to a Tier-4 emission standard or equipped with a Level-3 verified technology.

Costs

The economic impact for the proposed ATCM is based upon replacing an engine prematurely and the costs associated with the addition of air pollution equipment. Costs were projected from 2005 to 2037, the last year a cost would be attributed to the proposed ATCM.

The proposed regulation will require the early replacement of existing portable diesel-fueled engines with newer cleaner engines. The cost attributed to engine replacement or repower would be the economic value to the owner for each year the engine has been prematurely replaced. Based on information used for the emissions inventory and the PERP, staff assumed the useful life of a diesel-fueled portable engine to be about 25 years. The lost useful life would be the difference between 25 years and the average age of the affected engines at the time a standard becomes effective that forces the replacement of the engines. The average age of each affected group of engines was based upon the age of engines for similar types of engines registered with the PERP. Conversely, for the purposes of this analysis, engines that are more than 25 years old have reached the end of their useful life, and no cost was include in the economic impact of the proposed ATCM for the replacement of this group of engines.

To estimate the economic impact caused by early replacement of portable engines, staff estimates the annual value for each year of lost useful life as the cost of the engine annualized over a 25-year period. The cost to replace or repower a portable engine is expected to range between $135-220/horsepower. The $135 dollars per horsepower represents replacement and installation of the engine and the $220 dollars per horsepower represents the cost of replacing an entire unit, such as a generator set.

The use of verified Level-3 control technologies will be necessary to satisfy the proposed fleet standards that become effective by January 1st, 2017. For the purposes of evaluating the economic impact associated with these standards, the cost is based upon retrofitting the engines with diesel PM particulate filters. The cost of a filter is estimated at $40/horsepower and this cost would be paid out over 10-year period. Based upon current manufacturer's guarantees of 8,000 hours of use for a particulate trap and the average operation of a portable diesel-fueled engine, the particulate trap should have a useful life of 16 years. In some cases, an additional particulate trap was included in the cost analysis.

All costs are reported as 2002 dollars. Where future costs are mentioned, they have also been adjusted to 2002 dollars using standard accepted economic procedures. An annual interest rate of five percent is used. In addition, no cost or benefit was included for the ATCM for engines registered with PERP for the purposes of complying with the 2010 requirement. Engines registered with the PERP are already required to be replaced by January 1st, 2010.

2010 Requirement that All Engines Must be Certified

This requirement is expected to affect 11,500 engines. At January 1st, 2010, these engines would have five years of useful life at the time the engine was replaced. Cost associated with early replacement would be distributed from 2010 to 2014. In addition, agricultural irrigation pump engines were assumed to have five years of useful life at the time the engine was replaced.

No costs were assumed for engines that are already at the end of their useful life. This was true of 25% of the engines that are less than 175 horsepower and 37% of the engines that are 175 horsepower and larger.

2013 Fleet Emission Standard

The proposed fleet standard would require the replacement or use of retrofit technology on nearly all Tier 1 engines that are less than 750 horsepower. This requirement is expected to affect about 6,000 engines. At January 1st, 2013, these engines would have operated 9-17 years or would have a remaining useful life of 8-16 years at the time the engine was replaced. Cost associated with early replacement would be distributed from 2010 to 2028.

The engines that are less than 175 horsepower would be replaced with a Tier 3 engine, since the Tier 4 engines are not expected to be available for this horsepower range until 2012 or 2013. For engines that are 175 horsepower and larger, Tier 4 engine are expected to be available since 2011. The economic impact analysis assumes that all engines within this size range would be replaced with a Tier 4 engine. In addition, staff included in the analysis the purchase of an additional diesel particulate filter 15 years after the initial engine purchase.

2017 and 2020 Fleet Emission Standard

The proposed fleet standards will require the retrofit of 30,000 engines. About half of the retrofits would occur by January 1st 2017 and the remainder would be completed by January 1st, 2020. In addition, engines that have not been subject to the fleet requirements (engines used only in emergency applications or are low-use engines) would be required to either retrofit or replace the engine.

Appendix H

Cost Analysis Example

For a Typical Small Business Complying with the Proposed ATCM Requirements

Cost Analysis Example

For a Typical Small Business Complying with the Proposed ATCM Requirements

Background

The following is an example of a cost analysis for a typical small business complying with the proposed ATCM requirements. Small businesses typically have five or fewer portable diesel-fueled engines, with the average small business owning three engines.

The small business (Company A) fleet consists of:

78-horsepower (hp) certified engine (manufactured 1998)
129-hp non-certified engine (manufactured 1988)
363-hp non-certified engine (manufactured 1988)

These engines reflect the size and age for the average engine in a typical fleet.

Complying with 2010 requirement

To comply with the 2010 requirement, the 129-hp and 363-hp engine would need to be replaced. The 78-hp engine is already a certified engine.

Cost for replacement is assumed to be $220 per horsepower. This is based upon complete replacement of an existing unit, including engine and related engine equipment, trailer, and enclosure. Cost can be lower, particularly if an owner elects to repower or replace the existing engine versus total replacement of the unit.

129-hp engine: replacement engine costs = $28,380
363-hp engine: replacement engine costs = $79,860

The cost for early replacement of the above engines would be based on: 1) the loss of useful life resulting from complying with the regulation, which is the difference between 25 years (assumed useful life of a diesel engine) and the age of the engines at time of replacement (or 2010), and 2) the value for each year of useful life, which is based upon the annualized cost of an engine over 25 years at an effective interest rate of 5 percent.

The annualized cost for the engines are:

129-hp engine: $2,060/year
363-hp engine: $5,790/year

As of January 1, 2010, each engine would have a remaining useful life of three years (2010 - 1988 = 22 years). Therefore, the cost for compliance with the 2010 requirement would be:

129-hp engine: $2,060 each year 2010 to 2012 inclusive = $6,180, which has a present worth value of $3,986
363-hp engine: $5,790 each year 2010 to 2012 inclusive = $17,370, which has a present worth value of $11,205

Complying with 2013 fleet standards

Company A is subject to two fleet standards on January 1, 2013. The 78-hp and 129-hp engines must satisfy the fleet average of 0.3 g/bhp-hr that applies to engines that are less than 175-hp. Similarly, the 363-hp engine must satisfy the fleet average of 0.15 g/bhp-hr for engines 175-749 hp.

<175-hp fleet average = (78-hp*0.69 g/bhp-hr + 129-hp*0.22 g/bhp-hr)/(78-hp +129-hp)

= 0.397 g/bhp-hr

>175-hp fleet average = (363-hp*0.15 g/bhp-hr)/363-hp

= 0.15 g/bhp-hr

To comply with the 2013 fleet requirement, Company A will need to replace the 78-hp engine. Because the 129-hp and 363-hp engines were replaced to satisfy the 2010 requirement, these engines are certified to Tier 2/3 levels. Tier 2/3 engines would individually comply with the 2013 fleet standards.

If the 78-hp engine, which is certified to a Tier 1 level (no PM standard is applicable for Tier 1 engines of this size), were replaced with an engine certified to Tier 2/3 levels, Company A's fleet average for the <175-hp fleet average would be 0.25 g/bhp-hr.

Using the same criteria used above to assess the economic impact to replace the 129-hp and 363-hp engines, the following would apply for replacing the 78-hp engine:

- Replacement engine costs = $17,160
- The annualized cost = $1,241/year
- At 2013, the engine would have a remaining useful life of 10 years (2013 – 1998 = 15 years)

The cost for compliance with the 2013 requirement would be:

$1,241 each year 2013 to 2022 inclusive = $12,410, which has a present worth value of $5,882.

Complying with 2017 fleet standards

Company A is subject to two new fleet standards on January 1, 2017. The 78-hp and 129-hp engines must satisfy a fleet average of 0.18 g/bhp-hr that applies to engines that are less than 175 hp. Similarly, the 363-hp engine must satisfy a fleet average of 0.08 g/bhp-hr for engines 175 to 749 hp. To comply with the 2017 fleet requirement, Company A will need to retrofit the 129-hp engine and 363-hp engine with particulate filters. In these calculations, the filter is assumed to be 85 percent efficient or to reduce the engine's diesel PM emissions to 15 percent of engine's certified emission levels.

<175-hp fleet average = (78-hp * 0.3 g/bhp-hr + 129-hp *0.22 g/bhp-hr *0.15 control factor)/(78-hp+129-hp)

= 0.13 g/bhp-hr

>175-hp fleet average = 363-hp *0.15 g/bhp-hr*0.15 control factor /363-hp

= 0.02 g/bhp-hr

Note that Company A is now in compliance with the 2020 fleet standard for engines rated between 175 to 749 hp.

To assess the economic impact of adding particulate filters, the cost was based upon $40 per hp.

129-hp engine: filter costs of $5,160
363-hp engine: replacement engine costs $14,520

The cost was annualized over a 10 year period at an effective interest rate of 5 percent. The annualized cost for the filters are:

129-hp engine: $1,000/year
363-hp engine: $2,220/year

In summary, the cost for satisfying the 2017 fleet standard would be:

129-hp engine: $1,000 each year 2016 to 2025 inclusive = $10,000, which has a present worth value of $4,094)
363-hp engine: $2,220 each year 2016 to 2025 inclusive = $22,200, which has a present worth value of $9,090)

Complying with 2020 fleet standards

To comply with the 2020 fleet standards for engines rated at less than 175 hp, Company A will need to retrofit the 78-hp engine with a particulate filter.

Using the same criteria used above to assess the economic impact for adding particulate filters to the 129-hp and 363-hp engines, the following would apply for the 78-hp engine:

- Filter costs = $3,140
- Annualized costs of filter = $730 a year

Cost for compliance would be $730 each year from 2019 to 2028 inclusive ($7,300, which has a present worth value of $2,263)

Total costs (present worth in 2002 dollars)

The total costs for the small business would be about $36,500, with the cost occurring from 2010 to 2028.

Appendix I

List of Acronyms and Abbreviations

LIST OF ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
ARB	Air Resources Board
ATCM	Airborne Toxic Control Measure
BACT	Best available control technology
Board	Air Resources Board
Bhp	Brake horsepower which is equivalent to horsepower
CAA	Federal Clean Air Act
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resource Board
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
Certified engine	An engine certified to ARB/federal newly manufactured off-road engine emission standards
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CI	Confidence Interval
Diesel PM	Diesel Particulate Matter
District	Air pollution control or air quality management district
Diesel Risk Reduction Plan	Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles
DOC	Diesel Oxidation Catalyst
DOF	Department of Finance
DPF	Diesel particulate filter
DTSC	Department of Toxic Substance Control
EO	Executive Officer of the Air Resources Board
FSOR	Final Statement of Reasons
FTF	Flow-through filter
g/bhp-hr	Grams per brake horsepower-hour
GSE	Ground Support Equipment
HC	Hydrocarbon
hp	Horsepower which is equivalent to brake horsepower
H&SC	California Health and Safety Code
ISOR	Initial Statement of Reasons
$\mu g/m^3$	Microgram per cubic meter
MOU	Memorandum of Understanding

NAAQS	National Ambient Air Quality Standard
NO	Nitrogen oxide
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
OCS	Outer Continental Shelf
OEHHA	Office of Environmental Health Hazard Assessment
Off-Road Model	Off-Road Emissions Model
PAH	Polycyclic Aromatic Hydrocarbons
PERP	ARB's Statewide Portable Equipment Registration Program
PM	Particulate matter
PM_{10}	Particulate matter 10 microns or less in diameter
$PM_{2.5}$	Particulate matter less then 2.5 microns in diameter
ppm	Parts per million
Proposed ATCM	Proposed air toxic control measure for diesel-fueled portable engines
ROE	Return on Owner's Equity
ROG	Reactive Organic Gases
SCR	Selective Catalytic Reduction
SIC	Standard Industrial Classification
SRP	Scientific Review Panel
SCAQMD	South Coast Air Quality Management District
SOF	Soluble Organic Fraction
SO_2	Sulfur Dioxide
TAC	Toxic air contaminant
Tier 1-3 engine	Engines certified to California/federal newly manufactured Tier 1, 2 or 3 off-road engine emission standards
Tier 4 engine	Engines certified to United States Environmental Protection Agency's proposed Tier 4 off-road engine emission standards
tpd	Tons per day
TSE	Tactical Support Equipment
UL	Underwriters Lab
Uncertified engine	Engines that are not certified to a California/federal newly manufactured off-road engine emission standard
U. S. EPA	United States Environmental Protection Agency

TITLE 13. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER THE ADOPTION OF PROPOSED AMENDMENTS TO THE REGULATION FOR THE STATEWIDE PORTABLE EQUIPMENT REGISTRATION PROGRAM

The Air Resources Board (ARB or Board) will conduct a public hearing at the time and place noted below to consider the proposed amendments to the Statewide Portable Equipment Registration Program Regulation (Statewide Regulation).

DATE: February 26, 2004

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Central Valley Auditorium, Second Floor
1001 I Street
Sacramento, California 95814

This item will be considered at a two-day meeting of the ARB, which will commence at 9:00 a.m., February 26, 2004, and may continue at 8:30 a.m., February 27, 2004. This item may not be considered until February 27, 2004. Please consult the agenda for the meeting, which will be available at least 10 days before February 26, 2004, to determine the day on which this item will be considered.

If you have special accommodation or language needs, please contact the ARB's Clerk of the Board at (916) 322-5594 or sdorais@arb.ca.gov as soon as possible. TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed amendments of title 13, California Code of Regulations (CCR), article 5, sections 2450, 2451, 2452, 2453. 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, and repeal of 2466 which is the Statewide Portable Equipment Registration Program.

Background: The Statewide Regulation was approved by the Board on March 27, 1997 and became effective on September 17, 1997. The Board also approved amendments to the Statewide Regulation on December 11, 1998.

The Statewide Regulation establishes a uniform program to register portable engines and equipment units in California. Once registered in this voluntary program, owners or operators of portable engines and associated equipment units can operate throughout the State without having to obtain permits from individual air pollution control and air

quality management districts (districts). However, the districts play an important role in enforcing the requirements of the Statewide Regulation.

The current Statewide Regulation requires a phase-in of cleaner technologies that would result in the reduction and eventual elimination of high-emission engines. By January 1, 2010, any engine registered in the Statewide Portable Equipment Registration Program (Statewide Program) must be replaced or modified to meet California or federal nonroad emission standards (certified engines). Portable engines used on dredges must be retrofitted or replaced with certified engines by January 1, 2005.

Since 1997, ARB staff has received approximately 5,600 registration applications. Currently, the PERP program has about 14,500 portable engines, 1,500 associated equipment units, and another 5,200 pieces of military tactical support equipment (TSE) registered in the program.

DESCRIPTION OF THE PROPOSED REGULATORY ACTION

The proposed amendments to the Statewide Regulation are summarized in the following major categories:

Applicability Section

The proposed amendments would not allow the use of engines registered under the Statewide Regulation for certain specified applications. These applications include using portable generators to feed the electrical grid; providing primary or supplemental power to a building, stationary source or stationary equipment; or using registered engines to supplement or otherwise power equipment or operations permitted by the districts. For these applications, district approval would be necessary. Portable engines used in maintenance and repair, and emergency operations would continue to be allowed to operate under the Statewide Regulation. In addition, the temporary use of portable generators in remote locations, where grid power is unavailable, may be allowed under the Statewide Regulation upon approval of the Executive Officer.

Previously Exempt and Unpermitted Engines

Of the 33,000 portable engines estimated to be operating in California, 15,500 engines are believed to be operating without permits or registrations. Currently, the Statewide Regulation allows only portable engines certified to California or federal nonroad emission standards (certified engines) to register in the Statewide Program. ARB staff is proposing to allow any portable engine operating in California before 2003, certified or not, to apply and obtain registration under the Statewide Regulation until December 31, 2005. After that time, only certified engines will be accepted into the Statewide Program. The purpose of the proposed amendment is to encourage owners and operators of portable engines operating in California to seek registration and ultimately bring their equipment into compliance with State regulatory requirements.

Without this proposed amendment, many owners/operators of portable equipment would not be able to obtain registration or permits from local districts.

Increase Program Fees

Pursuant to Health and Safety Code section 41752(d), the ARB has established a fee schedule to collect registration, renewal, and other fees under the Statewide Regulation to cover resources necessary to operate and maintain the Statewide Program. When first establishing the Statewide Regulation, staff significantly underestimated the resources necessary to operate and maintain the Statewide Program. Fees currently collected do not cover the State's cost to administer the Statewide Program. Because of the current budget crisis, the ARB can no longer subsidize the costs of running the Statewide Program.

Staff is proposing an increase in fees to cover the full cost of the Statewide Regulation. Among the fees propose to be increased are the initial application fee from $90 to $270 for a 3-year registration and renewal fee from $90 to $225 for a 3-year renewal.

Recordkeeping and Reporting

The proposed amendments would require owners/operators of engines who are subject to daily recordkeeping requirements to keep a log onsite with each unit to track operation of the engine. The retention time for maintaining the records would be extended from two years to five years. Also, the operators of engines that are subject to hour limitations would be required to install hour meters. Staff is also proposing to remove the requirement for the submittal of annual reports to ARB staff; however, owners would need to make those reports available to district and ARB staff upon request. In addition, operators of generators used to power a building or stationary source during an unforeseen interruption of electrical power would be required to record the location, date, and length of time the generator was operated.

Miscellaneous Amendments

ARB staff is proposing to modify, add, and delete terms in the definition section, delete outdated provisions, require non-operational engines to be made operational, clarify the process for the change of ownership of registered engines, and modify the requirements for identical replacements of engines. These changes are considered to be non-substantive and are intended to provide additional clarity and enforceability to the Statewide Regulation.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

ARB staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed amendments to the Statewide Regulation. *The Executive Summary* provides an overview of the proposed amendments to the Statewide Regulation. It contains a summary of the recommendations and a brief discussion of the environmental and economic impacts of the proposal. *The Technical Support Document* is a more detailed presentation of the technical aspects of the proposed amendments to the Statewide Regulation.

Copies of the Staff Report and the full text of the proposed regulatory language may be obtained from the Board's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, CA 95814, (916) 322-2990 at least 45 days prior to the scheduled hearing which will begin on February 26, 2004.

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons in this notice, or may be accessed on the web site listed below.

Inquiries concerning the substance of the proposed regulations may be directed to the designated agency contact persons, Todd Wong, Manager of the Technology Assessment Section, at (916) 324-8031 or by email at twong@arb.arb.ca.gov or Winston Potts, Air Resources Engineer, PE, Technology Assessment Section, (916) 327-5600 or by e-mail at wpotts@arb.ca.gov.

Further, the agency representative and designated back-up contact persons to whom non-substantive inquiries concerning the proposed administrative action may be directed are Artavia Edwards, Manager, Board Administration & Regulatory Coordination Unit, (916) 322-6070, and Alexa Malik, Regulations Coordinator, (916) 322-4011. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

If you are a person with a disability and desire to obtain this document in an alternative format, please contact the ARB's Clerk of the Board at (916) 322-5594, or sdorais@arb.ca.gov as soon as possible. TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

This notice, ISOR, and all subsequent regulatory documents, including the FSOR, when completed, are available on the ARB Internet site for this rulemaking at *http://www.arb.ca.gov/regact/portreg/portreg.htm*.

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determination of the Executive Officer concerning the costs or savings necessarily incurred by public agencies, private persons, and businesses in reasonable compliance with the proposed amendments to the Statewide Regulation are presented below.

Pursuant to Government Code sections 11346.5(a)(5) and 11346.5(a)(6), the Executive Officer has determined that the proposed regulatory action will result in neither costs nor savings impacts to any state agency or in federal funding to the state, costs or mandate to any local agency or school district, whether or not reimbursable by the state pursuant to part 7 (commencing with section 17500), division 4, and title 2 of the Government Code, as discussed below or other non-discretionary savings to local agencies.

The cost to local agencies primarily involves the increase in renewal and administrative fees for those agencies with portable engines and associated equipment units registered in the Statewide Program. The total economic cost to local agencies is estimated to be $76,000. These costs are not reimbursable state mandated costs pursuant to part 7 (commencing with 17500), division 4, title 2 of the Government Code because most if not all, of these agencies are authorized to collect fees to recoup their cost under Section 17500 et seq. of the Government Code. The proposed amendments to the Statewide Regulation apply to all entities who operate portable engines and chose to register those engines in the Statewide Program, and, therefore, does not impose unique requirements on local government agencies.

The Executive Officer has determined that individual local air districts may incur permitting and enforcement costs as a result of implementing the proposed amendments to the Statewide Regulation. However, the costs incurred by the districts are not reimbursable state costs because of the districts' authority to recover permitting and enforcement costs through fees assessments authorized under Health and Safety Code sections 41512 and 42311. Also, the costs incurred by the district of inspecting registered engines are recoverable under section 2461(e), title 13, CCR.

The Executive Officer has determined that State agencies will incur a total economic impact of $27,000. Given the current fiscal and economic conditions, the Executive Officer cannot determine with certainty whether State agencies will be able to absorb these additional costs within current or future budgets, but it is anticipated that the agencies will be able to absorb annualized costs of this magnitude.

In developing the regulatory proposal, ARB staff evaluated the potential economic impacts on representative private persons or businesses. Summarized below are cost impacts that a representative private person or business would necessarily incur in reasonable compliance with the proposed action.

The Executive Officer has made an initial determination that the proposed regulatory action will have minimal statewide adverse economic impacts directly affecting businesses. The Executive Officer has also assessed that the proposed regulatory

action will have minimal statewide adverse economic impacts directly affecting the ability of California businesses to compete with businesses in other states or representative private persons.

The Executive Officer has determined, pursuant to title 1, CCR, section 4, that the proposed amendments to the Statewide Regulation will affect small businesses. The total economic impact to small businesses would be $1.1 million dollars. The total economic impact to all businesses would be $1.57 million dollars. The increased costs are for those businesses that use portable engines in applications that would require permits from local districts, increased costs from the proposed increase in renewal fees, costs to register non-operational engines that have been made operational, costs for engines required to install hour meters, and costs for increased recordkeeping requirements.

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed regulatory action will not affect the creation or elimination of jobs within California, the creation of new businesses or elimination of existing businesses within California, or the expansion of businesses currently doing business within California. A more detailed assessment of economic impact is found in the Staff Report.

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the Executive Officer has found that the amended reporting requirements that apply to businesses are necessary for the health, safety, and welfare of the people of the State of California.

The proposed amendments to the Statewide Regulation will continue to have a beneficial effect on the California business climate by eliminating the need for duplicative permits, allowing increased flexibility, and lowering overall costs compared to obtaining and maintaining multiple district permits.

Before taking final action on the proposed regulation , the Board must determine that no reasonable alternative considered by the agency or that has otherwise been identified and brought to the attention of the agency would be more effective in carrying out the purpose for which the amendment is proposed, or would be as effective and less burdensome to affected private persons than the proposed action.

A detailed assessment of the economic impacts of the proposed regulatory action can be found in the Initial Statement of Reasons.

SUBMITTAL OF COMMENTS

The public may present comments relating to this matter orally or in writing at the hearing, and in writing or by e-mail before the hearing. To be considered by the Board, written submissions must be received **no later than 12:00 noon, February 25, 2004**, and addressed to the following:

Postal mail is to be sent to:

Clerk of the Board
Air Resources Board
1001 I Street, 23rd Floor
Sacramento, California 95814

Electronic mail is to be sent to: portreg@listserv.arb.ca.gov, and received at the ARB **no later than 12:00 noon, February 25, 2004**.

Facsimile submissions are to be transmitted to the Clerk of the Board at (916) 322-3928 and received at the ARB **no later than 12:00 noon, February 25, 2004**.

The Board requests but does not require 30 copies of any written submission. Also the ARB requests that written, facsimile, and e-mail statements be filed at least 10 days prior to the hearing so that ARB staff and Board Members have time to fully consider each comment. The ARB encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under the authority granted to the ARB in Health and Safety Code sections 39600, 39601, 41752, 41753, 41754, 41755, 43013, and 43018. This action is proposed under the authority granted to the ARB in Health and Safety Code sections 41750, 41751, 41752, 41753, 41754, and 41755.

HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340) of the Government Code.

Following the public hearing, the ARB may adopt the regulatory language as originally proposed or with non-substantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice that the regulatory language as modified could result from the

proposed regulatory action. In the event that such modifications are made, the full regulatory text, with the modifications clearly indicated, will be made available to the public for written comment at least 15 days before it is adopted.

The public may request a copy of the modified regulatory text from the ARB's Public Information Office, Air Resources Board, 1001 "I" Street, Visitors and Environmental Center, 1st Floor, Sacramento, California 95814, (916) 322-2990.

CALIFORNIA AIR RESOURCES BOARD

Michael K. Scheible

for Catherine Witherspoon
Executive Officer

Date: 12/30/2003

"The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our Web-site at www.arb.ca.gov.

State of California
AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

Public Hearing to Consider

Proposed Amendments to the Regulation for the Statewide Portable Equipment Registration Program

To be considered by the Air Resources Board on February 26, 2004 at:

California Environmental Protection Agency
Headquarters Building
1001 "I" Street
Central Valley Auditorium
Sacramento, California

STATIONARY SOURCE DIVISION

Peter D. Venturini, Chief
Robert D. Barham, Assistant Chief
Michael J. Tollstrup, Chief, Project Assessment Branch
Todd S. Wong, Manager, Technology Assessment Section

This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

State of California
AIR RESOURCES BOARD

PROPOSED AMENDMENTS TO THE STATEWIDE PORTABLE EQUIPMENT REGISTRATION PROGRAM REGULATION

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Staff Report: Initial Statement of Reasons for the Proposed Amendments to the Statewide Portable Equipment Registration Program Regulation

Executive Summary

A. INTRODUCTION

This Executive Summary outlines the Air Resources Board staff's (staff) proposal to amend the Statewide Portable Equipment Registration Program Regulation (Statewide Regulation) as adopted by the Air Resources Board (ARB or Board) on March 27, 1997 and amended on December 10, 1998 for portable engines and associated equipment units.

The report comprises the Initial Statement of Reasons for the Proposed Amendments to Statewide Portable Equipment Registration Program Regulation as required by the Administrative Procedures Act (Government Code 11340 et seq.). The Executive Summary provides an overview of the proposed amendments to the Statewide Regulation, a summary of staff recommendations, and a brief discussion of the environmental and economic impacts resulting from the proposal. The Technical Support Document provides a more detailed presentation of the technical aspects of the proposed amendments to the Statewide Regulation.

B. BACKGROUND

California law establishes the authority to regulate motor vehicles with the ARB. Air pollution control and air quality management districts (districts) have been given the primary authority to regulate stationary sources of air pollution.

Although portable equipment shares attributes of both mobile and stationary sources, portable equipment has historically been permitted as a stationary source under district rules and regulations. The 35 districts treat portable equipment differently, having a variety of independent permit requirements and fee structures. As a result, owners of portable equipment must pay fees, obtain permits, and adhere to different sets of regulations as they move between districts.

In response to the need for a uniform and consistent statewide permitting program for portable engines, the California Legislature approved Assembly Bill 531 (AB 531), which the Governor signed in October 1995. AB 531 required the ARB to adopt a regulation that established a uniform statewide system to register and regulate portable engines.

Subsequent 1996 legislation, Assembly Bill 2653 (AB 2653) and Senate Bill 1880 (SB 1880), expanded the scope of the Statewide Regulation to include other equipment associated with portable engines. AB 2635 also prohibited source testing of engines for compliance purposes more frequently than once every three years unless emission problems are identified. It also clarified AB 531's intent to ensure that equipment registered in the Statewide Portable Equipment Registration Program (PERP) does not compromise the State Implementation Plan to attain the ambient air quality standards. In addition, recordkeeping and reporting requirements were to be the minimum necessary to provide emission data, track equipment use, and allow enforcement of the program. SB 1880 expanded the scope of the Statewide Regulation to include associated equipment units such as tub grinders, trommel screens, and wood chippers. SB 1880 also modified the definition of portable internal combustion engine to be consistent with federal law. AB 531, AB 2635, and SB 1880 are codified in sections 41750-41755 of the California Health and Safety Code.

State law also prohibits the districts from permitting, registering, or regulating portable engines and associated equipment units registered with the ARB. However, the districts are responsible for enforcement of engines registered under the State program. Portable engines and associated equipment units not registered with the ARB are subject to district permitting requirements.

Since the implementation of the PERP in 1997, ARB staff has received about 5,600 registration applications. Each application contains anywhere from one to a few hundred engines and associated equipment unit. Currently, the PERP has about 14,500 portable engines, 1,200 equipment units, and over 5,200 military tactical support equipment registered in the program.

C. PORTABLE ENGINE USE AND CURRENT REGULATIONS

1. What is a portable engine?

In broad terms, a portable engine is any piston-driven internal combustion engine that can be moved and would remain at a single location for less than 12 consecutive months. Unlike stationary engines, portable engines may be moved to several locations throughout the State, where they may operate for several hours or several months. Engines registered in the PERP are used for a variety of applications, such as pumps, ground support equipment at airports, military tactical support equipment, cranes, oil well drilling, servicing and work-over rigs, power generators, dredging equipment, rock crushing and screening equipment, welding equipment, woodchippers, and compressors.

2. What types of businesses and public agencies use portable engines?

Both private businesses and public agencies operate portable engines registered in the PERP. The types of businesses registering engines in the PERP include motion picture studios, amusement parks, air couriers, airlines, utilities, construction services, crushing, screening, and recycling services, industrial cleaning services, marine construction and dredging services, oil and gas companies, refineries, and rental services. Public agencies include public schools and universities, local governments, county landfills, municipal utilities, wastewater treatment facilities, prisons, the California Department of Transportation, and other state agencies.

3. How are portable engines and associated equipment units regulated in California?

a. ARB/U.S. EPA off-road engines standards

Since January 1, 1996, new diesel fueled portable engines sold in California have been subject to ARB's Off-Road Compression Ignition emission standards. These standards are equivalent to the U.S. EPA emission standards for newly manufactured nonroad (or off-road) engines. The standards are tiered (i.e. Tier 1, 2, 3), with each set of standards phased in over several years based on the power rating of the engine. In 2006, new portable engines of all sizes will be subject to Tier 2 standards, and in 2008, new engines of all sizes will be subject to Tier 3 standards. Tier 4 emission standards were proposed by U.S. EPA in April 2003, and if adopted, would require most engines to meet more stringent particulate matter (PM) and oxides of nitrogen (NOx) limits in the 2011 to 2014 timeframe.

b. Local air district permit programs

The ARB staff estimates that there are approximately 3,100 portable engines in California that are permitted by the districts. District permit requirements vary, depending on the severity of the air quality in the district. While some districts exempt portable engines altogether, other districts may require portable engines to meet emission limits that are equivalent to Best Available Control Technology (BACT). For some districts, BACT for portable engines means that the engine is certified to ARB/U.S. EPA emissions standards. Districts may also restrict the operating hours of portable engines to reduce air quality impacts to acceptable levels. If an owner chooses to obtain permits from the local districts, they must pay fees, and adhere to different sets of regulations as they move equipment among different districts.

c. Statewide Portable Equipment Registration Program

In lieu of obtaining multiple permits from individual districts, a portable engine owner can register the engine in the PERP. Currently, portable engine owners have registered

about 14,500 engines in the PERP, which represents nearly half of the estimated statewide inventory of portable engines. Most of the engines are diesel-fueled engines. As stated previously, about 3,100 engines are permitted or registered with the districts and 14,500 are registered under the PERP. The remaining 15,400 portable engine are either exempt from district permits or operators who have not obtained permits from the districts.

The Statewide Regulation was designed to promote the use of clean portable engines in California. By January 1, 2010, only engines certified to ARB/U.S. EPA off-road engine emission standards (Tier 1, 2, or 3) can be registered in the PERP (certified engines). This means that about one-third of the currently registered engines must be replaced with certified engines by that date.

On a parallel rulemaking effort with the proposed amendments to the Statewide Regulation, ARB staff is proposing the Airborne Toxic Control Measure for Diesel Particulate Matter from Portable Engines Greater than 50 Horsepower (Portable Engine ATCM) (title 13, California Code of Regulations (CCR), section 93116). The proposed Portable Engine ATCM requires all portable engines in 2010 to meet ARB/U.S. EPA off-road emission standards. In addition, progressively more stringent fleet averaging requirements are proposed for 2013, 2017, and 2020 to further reduce engine emissions. The proposed Portable Engine ATCM will be presented at the February 2004 meeting of the ARB

D. PUBLIC PROCESS

1. What action did staff take to consult with interested parties during the development of the proposed amendments?

In developing any regulations, the public, local districts, and affected industries play an important role in shaping the regulatory proposals. The ARB staff has made extensive efforts to have an open process and provide ample opportunity for input by all parties.

To assist in developing the proposed amendments to the Statewide Regulation, staff convened a Portable Equipment workgroup. The workgroup included sixty representatives from local and state air quality agencies and affected industries such as oil services and well drilling, construction, water agencies, sanitation services, rental companies, the military, telecommunication companies, and utility companies.

From January 2002 to September 2003, the ARB staff held six workgroup meetings in Sacramento. Besides attending in person, staff also provided the option of participating in the meetings by conference calls. The meeting dates for the proposed amendments of the Statewide Regulation and the proposed Portable Engine ATCM were coordinated to allow interested parties to participate in both rulemaking efforts affecting portable engines. ARB staff held public workshops on October 3, 2003, November 18, 2003,

and December 4, 2003 to solicit comments from the public on the proposed amendments.

Staff also created an e-mail list serve to notify interested parties of the meeting dates and the availability of information to be discussed at the meetings. A web site was developed where interested parties could download information such as meeting agendas and staff proposals, as well as providing links to other-related ARB web sites. The web site address is located at *http://www.arb.ca.gov/diesel/portdiesel.htm.*

Staff participated in numerous individual meetings and conference calls with affected industries to address specific concerns. In addition, staff attended several meetings of the California Air Pollution Control Officers Association (CAPCOA) Engineering Managers Committee and the Enforcement Managers Committee to discuss district the current PERP and to solicit comments on the proposed amendments to the Statewide Regulation.

E. SUMMARY OF THE PROPOSED AMENDMENTS TO THE STATEWIDE PORTABLE EQUIPMENT REGISTRATION REGULATION

1. What equipment will qualify for registration in the PERP?

During the 2001 energy crisis, there were proposals to bring in large portable generators to produce electricity to meet the State's energy demands. Also, businesses that had enrolled in programs to curtail energy use in exchange for lower energy rates were asked to reduce their energy consumption. These are known as load reduction programs. In order to maintain production, a number of these facilities brought in portable generators. The NOx emission rates from portable engines are from 100 to several hundred times greater than modern power generation facilities. Accordingly, the Executive Officer had to clarify that the PERP registered engines were not to be used for these applications, except in cases where an imminent blackout was declared for an area and only for the duration of the blackouts. To provide clarity in the Statewide Regulation and reflect ARB policy, ARB staff is proposing that portable generators used to feed an electrical grid and portable generators used to provide power to a building, a stationary source, or stationary equipment would need to obtain district permits.

Equipment such as portable hot mix asphalt plants, boilers, and heaters are sources that are subject to district permit programs. In some applications, portable engines are used to power the permitted equipment. ARB staff believes that the permitted equipment and the portable engines should be evaluated under a single regulatory program; therefore, ARB staff is proposing that portable engines be required to obtain district permits when used to power equipment that is permitted by the districts. The owners of the portable engines can retain and use their PERP registration in other applications.

Since July 1, 2001, the Statewide Regulation has prohibited portable engines that do not meet ARB/U.S. EPA nonroad emission standards to enter the PERP. This restriction has generally prevented pre-1996 engines from registering in the program. ARB staff is proposing to allow existing portable engines operating in California that were previously exempt from district permits and existing engines that should, but do not have district permits, to register in the PERP by December 31, 2005. The proposal would even allow engines that were not manufactured to meet ARB/U.S. EPA emission standards to be registered. This amendment is being proposed to comport with the proposed Portable Engine ATCM, which would require all portable engines greater than 50 horsepower to obtain permits or registration and meet specified requirements. In many cases, the engines do not meet nonroad emission standards or the districts' New Source Review BACT requirements. After discussions with the CAPCOA Engineering Managers Committee and to provide flexibility to engine owners, ARB staff proposes to allow these engines to register in the PERP until the end of 2005. After that time, only certified engines will be allowed into the program. Once in the program, the owners of these engines will be required to comply with the requirements of the PERP, including the 2010 requirement that engines meet certified nonroad emission standards.

2. <u>Why are program fees proposed to be increased?</u>

ARB staff is proposing to increase program fees to make this program commensurate with the resources currently needed to implement the program. As specified in Health and Safety Code section 41752 (d), the ARB is authorized to charge fees to cover the cost of operating the PERP. Since the inception of the PERP, the fees collected fall short of the staff resources used to implement the PERP. Staff is proposing that the existing fee schedule for all tasks (except for the initial military tactical support equipment application fee) be increased to cover staff costs. The major increases are for the initial application fee where the current 3-year registration fee of $90 would increase to $270 and renewal fees where the current 3-year renewal fee of $90 would increase to $225. Even with the proposed fee increases, PERP registration will be considerably less costly than permit fees required by the districts. For a 500 horsepower engine, the cost for district permits range from $150 to $2,167 and renewal fees range from $90 to $1,012 per year.

3. <u>What other amendments are being proposed?</u>

Other amendments include removing the outdated requirements for equivalent engine replacements and clarifying when identical engine replacements are allowed. Before July 1, 2001, owners were able to replace uncertified engines with an equivalent replacement engine of the same emissions and size range. The Statewide Regulation now requires equivalent engine replacements to meet the most stringent emission standards; therefore, ARB staff is proposing to delete the provisions for equivalent engine replacement. ARB staff is also proposing to clarify that an identical engine

replacement is allowed only when the engine has a mechanical breakdown. This is proposed to allow only legitimate identical engine replacement to occur.

The Statewide Regulation does not specify the process for change of ownership when a PERP registered engine is sold from one person to another person. The proposed amendments will specify that a change of ownership is allowed when the ARB receives from the new owner, a completed change of ownership application along with the appropriate fees. At this point, the new owner can operate the portable engine under the PERP.

Senate Bill 700, which was signed by Governor Davis on September 22, 2003, removed the provision in State law that exempted agricultural sources from district permitting programs. The Statewide Regulation has a provision to exclude portable engines used in agricultural operations from registering in the program. ARB staff is proposing to remove the exemption from the Statewide Regulation to provide flexibility to owners/operators of portable agricultural engines to register in the PERP in those districts that choose to not permit portable agricultural engines.

The proposed amendments would require owners/operators of non-operational engines to make those engines operational and that non-operational engines would no longer be accepted in the program. In the early years of the PERP, non-operational engines were allowed in the program to provide owners/operators the flexibility of registering their uncertified engines before the July 1, 2001 deadline in order to meet future needs. The non-operational engine provision was used sparingly in the early years of the program. Also, ARB staff has not received any applications for non-operational engines in the past few years because only certified engines are allowed in the program. Therefore, ARB staff is proposing to remove the non-operational provision and to not allow future non-operational engines into the program.

The proposed amendment to the recordkeeping and reporting requirements are minimal and would improve the enforceability of the Statewide Regulation. Operators would be required to records when portable engines are used to power a stationary source or stationary equipment during an interruption of electrical service from a serving utility company.

The military bases are on a three-year billing cycle for tactical support equipment registered in the PERP. They are required to submit annual reports to the ARB staff updating their inventory of tactical support equipment. If their inventory increases, cost adjustments are made to their bills. To align the billing cycle and annual reports, ARB staff is proposing amendments that will revise the billing cycle to one year rather than three years.

F. ENVIRONMENTAL AND ECONOMIC IMPACTS OF THE PROPOSED AMENDMENTS TO THE STATEWIDE REGULATION

1. What are the expected environmental impacts of the proposed amendments?

It is expected that the proposed amendments to the Statewide Regulation will have no direct environmental impacts. The discussion below will identify the different areas that may be affected.

The proposed amendment requires district permits for the use of portable engines in certain applications. ARB staff does not expect that this requirement will result in a large number of owner/operators having to obtain permits from the districts and will probably occur in a few locations. Consequently, the emission impacts should be minor.

ARB staff is proposing amendment to allow owners/operators of portable engines that were previously exempt from district permits and those who should, but have not obtained district permits, to register in the PERP by December 31, 2005. This is expected ultimately to result in a positive environmental benefit. The positive benefit will come from uncertified engines that come into the PERP and replaced with certified engines in order to comply with the 2010 engine requirements.

The other miscellaneous amendments such as to increase program fees, to delete outdated provisions, and changes to recordkeeping and reporting requirements will not have any adverse environmental impacts. The reason is that these amendments are administrative in nature, which provides better clarification and enforceability of the Statewide Regulation.

2. What are the economic impacts of the proposed amendments?

Staff estimates that the economic impact of the proposed amendments to the Statewide Regulation to affected businesses and government agencies is $2.2 million dollars.

The proposed amendments to the Statewide Regulation will require certain uses of portable engines to be permitted with the districts. ARB staff anticipates that relatively few owners of portable engines will be impacted by the proposed amendments. ARB staff estimates a cost impact of $415,000.

The proposed amendments to the Statewide Regulation will increase the fees associated with the PERP in order to meet operating expenses. ARB staff estimated the total economic impact from increased renewal and administrative fees to be $1.38 million dollars.

In some areas in California, portable engines (less than 1000 cubic inches) are not required to be permitted by the districts. Also, there are many portable engine owners who have not permitted their equipment in district permit programs. If the proposed Portable Engine ATCM is implemented, it is likely that these engines will have to obtain district permits. As an alternative to district permits, ARB staff is proposing to allow owners/operators to register their certified and uncertified engines in the PERP. Uncertified engines have until 2006 to register in the program and will be subject to daily and annual PM and NOx emission caps. By 2010, all portable engines operating in California must meet ARB/U.S. EPA off-road emission standards.

Most portable engine owners who were previously exempt from district permits or have been operating without district permits will now have the option of obtaining district permits for their equipment or participating in the PERP. ARB staff believes that their decision will be based on which program gives them the most favorable economic advantage. Currently, the registration fees for the PERP is less than the fees assessed by the districts for permit processing and permit renewal.

The economic cost for complying with the proposed recordkeeping and reporting requirements and other administrative requirements is estimated by ARB staff to be $410,000. Because PERP is a voluntary program, business owners and government agencies that determine that the program is not financially advantageous and administratively convenient can obtain district permits.

G. NEXT STEPS

Upon approval by the Board of the proposed amendments to the Statewide Regulation, ARB staff will continue to implement the PERP and continue its outreach efforts with affected parties, industry associations, and governmental agencies. ARB staff will work with the CAPCOA and affected parties to inform owners/operators of PERP registered equipment of the amendments to the Statewide Regulation. ARB staff will work with the districts to identify portable engine owners that have not obtained permits or have not registered their equipment in the PERP. These unregulated engine owners will need to be identified and brought into the regulatory process so that all owners of portable engines in the State are ultimately complying with applicable portable engine requirements.

H. RECOMMENDATION

The staff recommends that the Board approve the proposed amendments to the Statewide Regulation. The proposed amendments will retain the flexibility of operating portable engines and associated equipment units throughout the State without having to obtain multiple district permits. The proposed amendments define more specifically which portable engines and equipment units qualify for registration in the PERP and will provide for increased program fees to cover the cost staff resources needed to

implement the PERP. It will also delete outdated provisions from the Statewide Regulation, and provide additional flexibility for unpermitted engines and engines previously not required to be permitted with the districts.

State of California
AIR RESOURCES BOARD

Staff Report: Initial Statement of Reasons for the Proposed Amendments to the Statewide Portable Equipment Registration Program Regulation

Technical Support Document

I. INTRODUCTION

In this chapter, the Air Resources Board (ARB or Board) staff provides an overview of the Technical Support Document, discusses the purpose of the proposed amendments, and discusses the regulatory authority the ARB has to adopt the proposed amendments. This chapter also provides background information on the Statewide Portable Equipment Registration Program Regulation (Statewide Regulation), and discusses the outreach efforts of the ARB staff in developing the proposed amendments.

A. OVERVIEW

The Technical Support Document outlines the ARB staff's proposed amendments to the Statewide Regulation as first approved by the Board on March 27, 1997 and subsequently amended by the Board on December 11, 1998. The Statewide Regulation establishes the Statewide Portable Equipment Registration Program (PERP) to register portable engines and associated equipment units in California. Once registered in this voluntary program, portable engines and equipment units can operate throughout the State without having to be permitted by the local air pollution control and air quality management districts (districts). However, the districts are responsible for enforcing the requirements of the Statewide Regulation.

The technical information presented in this document supports and explains the proposed amendments to the Statewide Regulation. A copy of the proposed amended Statewide Regulation is included in Appendix A. In this report, the ARB staff will provide the following information:

- A summary of the proposed amendments to the Statewide Regulation;
- A discussion of portable engine use and existing regulatory programs for portable engines;
- Environmental and economic impacts; and
- Other supplemental information (Appendices).

B. PURPOSE

The primary purpose of the proposed amendments to the Statewide Regulation is to harmonize with the proposed Airborne Toxic Control Measure for Diesel Particulate Matter from Portable Engines Greater than 50 Horsepower (Portable Engine ATCM). In addition, staff is proposing additional amendments to provide clarity and ensure enforceability of the Statewide Regulation and increase program fees.

C. REGULATORY AUTHORITY

California Health and Safety Code (HSC) sections 41750 through 41755 mandate that the ARB adopt a regulation to establish a uniform statewide program for the registration and regulation of portable engines. In developing these regulations, the ARB is require to evaluate emissions, identify emission control technologies, hold public hearings, establish emission limits and control requirements, and develop a fee schedule to cover the costs to adopt and administer the program, including the cost of district enforcement.

HSC section 41752(e) specifies that the Board may periodically revise and update the registration regulations including, but not limited to, revising and updating a determination of best available control technology for portable engines. As stated earlier, the Board approved the Statewide Regulation on March 27, 1997 and amended it on December 11, 1998.

In addition, HSC sections 39600 (General Powers) and 39601 (Standards, Definitions, Rules, and Measures) confers to the ARB the general authority and obligation to adopt rules and measures necessary to execute the Board's powers and duties imposed by State law. The California Clean Air Act of 1988 granted the ARB authority to adopt standards and regulations for off-road vehicles and equipment. (HSC sections 43013(b) and 43018),

The federal Clean Air Act Amendments (CAA) of 1990 gave the United States Environmental Protection Agency (U.S. EPA) authority to regulate new nonroad (off-road) engines. The amendments created a federal preemption that, in general, prevents states (including districts) from adopting emissions standards or other requirements for non-road engines [CAA, section 209(e)]. Portable engines are a subset of non-road engines. However, recognizing the special circumstances confronting California, Congress allowed California, upon receiving authorization from the U.S. EPA, to adopt standards for preempted equipment with the exception of new engines under 175 brake-horsepower (bhp) used in farm and construction operations.

D. PUBLIC PROCESS

In developing any regulations, staff believes that the public, the districts, and the affected industries play an important role in shaping the regulatory proposals. Staff has made extensive efforts to have an open process and provided ample opportunity for input by all parties.

In developing the proposed amendments, staff had to balance the requirements of the State law with industry and district concerns. To assist in developing the proposed amendments to the PERP, staff convened the Portable Equipment Workgroup (Workgroup). The original workgroup was instrumental with the development of the 1997 Statewide Regulation and the 1998 amendments. Other interested parties were added to the workgroup. The workgroup consisted of over 60 representatives from local and state air quality agencies and affected industries such as oil services and well drilling, construction, water agencies, sanitation services, rental companies, the military, telecommunications, and utilities.

From January 2003 to September 2003, ARB staff held six workgroup meetings in Sacramento. Besides attending the meetings in person, staff also provided the option for people to participate by conference calls. The meeting dates for the proposed amendments of the Statewide Regulation and the proposed Portable Engine ATCM was coordinated to allow interested parties to participate in both rulemaking efforts affecting portable engines. ARB staff held public consultation meetings on October 3, 2003, November 18, 2003, and December 4, 2003, to solicit comments from the public on the proposed amendments.

Staff also created an e-mail list serve to notify interested parties of the meeting dates and the availability of information to be discussed at the meetings. A web site was developed where interested parties could download information such as meeting agendas and staff proposals, as well as providing links to other ARB web sites. The web site address is located at *http://www.arb.ca.gov/diesel/portdiesel.htm*.

Staff attended individual meetings and conference calls with affected industries and industry associations during the development of the proposed amendments to the Statewide Regulation to address their specific concerns. In addition, staff attended several meetings of the California Air Pollution Control Officers Association (CAPCOA) Engineering Manager Committee and the Enforcement Managers Committee to discuss the current PERP and to solicit their comments on the proposed amendments to the Statewide Regulation.

II. PORTABLE ENGINE USE AND EXISTING REGULATORY PROGRAMS

This chapter describes the uses of portable engines and associated equipment units that are registered in the PERP. In addition, this chapter describes the types of businesses that use portable engines and equipment units and the existing regulatory programs that currently impact portable engines used in California.

A. SUMMARY OF PORTABLE ENGINE USE AND ACTIVITIES

A portable engine is an internal combustion engine that is designed and capable of being carried or moved from one location to another and does not remain at a single location for more than 12 consecutive months. Unlike stationary engines, portable engines may be moved to several locations throughout the State, where they may operate for several hours or several months. The engines are used to power a variety of equipment, including: pumps (e.g., agricultural irrigation pumps and other water pumps), ground support equipment at airports, cranes, oil well drilling and workover rigs, power generators, dredging equipment, rock crushing and screening equipment, welding equipment, woodchippers, and compressors.

Both private businesses and public agencies operate portable engines and associated equipment in California. Examples of businesses that use portable engines in their activities include motion picture studios, amusement parks, air couriers, airlines, utilities, construction services, crushing, screening, and recycling services, industrial cleaning services, marine construction and dredging services, oil and gas companies, refineries, and rental services. Examples of public agencies that use portable engines include public schools and universities, local governments, county landfills, municipal utilities, wastewater treatment facilities, prisons, military installations, the California Department of Transportation, and other state agencies.

There is significant variation in the size of the engines as well as the way the engines are used. The size of engines can range from about 50 horsepower to 3,000 horsepower. The average annual operating hours for portable diesel-fueled engines is about 450 hours per year. Due to the mobile nature of portable engines, the emissions typically would not occur in one location, but would be spread out over many locations over the course of a year. In addition, the actual operation of a specific engine can vary significantly from the average. For example, engines used only for emergency applications may operate less than 20 hours per year. Conversely, some portable activities can operate more than 2,000 hours per year. Finally, the engine's load varies, depending upon the application. The average load is typically 50 percent of maximum load. Similar to the variability in the hours of operations, an engine's load can very significantly from application to application, from 25 percent to 80 percent of maximum load.

B. EXISTING REGULATORY PROGRAMS

This section describes the federal preemption that limits the authority of the ARB and local districts to regulate portable engines. It also describes specific federal, state, and local programs that currently impact portable engines used in California. These programs include the ARB/U.S. EPA emission standards for newly manufactured off-road engines, the PERP, and the local air pollution control and air quality management district (district) permitting programs. All of these programs play a role in the efforts of the ARB and districts to attain the State and federal ambient air quality standards, particularly the ozone standards. Consequently, the focus of the programs has been to reduce emissions of NOx, and to a lesser extent reduce emissions of carbon monoxide (CO), reactive organic gases (ROG), and particulate matter (PM).

1. Federal Preemption

The federal Clean Air Act (CAA) Amendments of 1990 authorized U.S. EPA to regulate new nonroad engines. The amendments created a federal preemption that prevents states, as well as districts, from adopting emission standards or other requirements for nonroad engines (CAA, section 209(e)). Portable engines are a subset of off-road engines. However, recognizing the special circumstances confronting California, Congress provided that the State of California, upon receiving authorization from the U.S. EPA, can adopt and enforce standards for most classes and categories of off-road engines. In California statutes, nonroad engines are referred to as off-road engines; therefore, these engines will be referred to as "off-road" in this report.

The federal preemption prevents all states, including California, from regulating new off-road engines less than 175 hp that are used in farm and construction operations and prevents the districts from requiring add-on air pollution controls or otherwise modifying portable engines. However, districts do maintain the authority to require permits and establish in-use restrictions (e.g. limit hours of operations).

2. ARB/U.S. EPA New Engine Emission Standards

As mentioned above, the CAA Amendments provided for ARB to adopt and enforce its own standards and regulations for off-road engines. Since January 1, 1996, new diesel fueled portable engines sold in California have been subject to ARB's Off-Road Compression Ignition emission standards (title 13, CCR, sections 2320 et seq.), which are equivalent to the U.S. EPA emission standards for newly manufactured nonroad engines (40 CFR, Part 89). The standards are tiered (i.e. Tier 1, 2, 3), with each set of standards phased in over several years based on the power rating of the engine. In 2006, newly manufactured portable engines of all sizes will be subject to Tier 2 standards, and in 2008, newly manufactured engines of all sizes will be subject to Tier 3 standards. Table II-1 illustrates the emission standards that will be in place for portable engines greater than 50 horsepower when Tier 1, Tier 2, and Tier 3 standards are fully phased in.

Table II-1: Emission standards (g/bhp-hr) that will be in effect when all current off-road standards are fully implemented

Rated Power (hp)	PM	CO	When Standards Apply	NMHC + NOx	When Standards Apply
Greater than or equal to 50 but less than 100	0.30	3.7	2004	3.5	2008
Greater than or equal to 100 but less than 175	0.22	3.7	currently	3.0	2007
Greater than or equal to 175 but less than 750	0.15	2.6	currently	3.0	2006
Greater than 750	0.15	2.6	2006	4.8	2006

In April 2003, U.S. EPA proposed Tier 4 emission standards for off-road engines. When these standards are promulgated, portable engines will be manufactured to meet more stringent PM and NOx limits in the 2011 to 2014 timeframe. The proposed Tier 4 emission standards are presented in Table II-2 below:

Table II-2: Proposed U.S. EPA Tier 4 Emission Standards (g/hp-hr)

Rated Power	First year that Standards Apply	PM	NOx
Greater than or equal to 25 but less than 75	2013	0.02	3.5*
Greater than or equal to 75 but less than 175	2012-2014	0.02	0.30
Greater than or equal to 175 but less than 750	2011-2013	0.01	0.30
Greater than 750	2011-2014	0.01	0.30

* The 3.5 g/hp-hr standard includes both NOx and nonmethane hydrocarbons.

3. Statewide Portable Equipment Registration Program

In lieu of obtaining multiple permits from individual districts, a portable engine owner can register the engine in the PERP. Currently, portable engine owners have registered about 14,500 engines in the PERP, which represents nearly half of the estimated statewide inventory of portable engines. Most of the engines are diesel-fueled engines. Of this amount, 14,123 are portable diesel fueled engines and 293 engines are gasoline, natural gas, kerosene, methanol, and liquid petroleum gas-fueled engines. In addition, there are 1,200 equipment units and over 5,200 military tactical support equipment registered in the program. A summary of PERP-registered portable diesel-fueled engines by size range is listed in Table II-3 below:

The Statewide Regulation was designed to promote the use of clean portable engines in California. By January 1, 2010, only engines certified to ARB/U.S. EPA off-road engine emission standards (Tier 1, 2, or 3) can be registered in the PERP. This means that any engines currently registered in the program that do not meet at least Tier 1 standards must be replaced with certified engines by that date. Also, portable engines operating on dredges must meet off-road emission standards by January 1, 2005.

Table II-3: Summary of Portable Diesel-Fueled Engines by Size Range Currently Registered in the PERP

Size Range (HP)	Number of Engines
Size not specified	8
<50	50
≥50 to <175	7,392
≥175 to <750	5,113
≥750	1,560

4. Local District Permit Programs

Portable engines not registered in the PERP may be subject to local district permitting requirements. ARB staff estimates that there are approximately 3,100 portable engines in California that are permitted by the districts. District permit requirements will vary, depending on the nonattainment status in the district. The State and federal permitting requirements (termed New Source Review (NSR)) have been incorporated into the districts' pre-construction and operating permit programs. NSR is intended to allow new sources to construct and existing sources to expand or modify operations in non-attainment areas. Sources constructing in nonattainment areas are required to apply the Lowest Achievable Emission Rate (LAER), which is referred to as Best Available Control Technology (BACT) in California, and to "offset" the remaining emissions with reductions from other sources. BACT varies among districts. For portable engines,

BACT in some districts is defined as an engine certified to the ARB/U.S. EPA off-road engine emission standards.

ARB staff reviewed district rules and surveyed a cross-section of air districts to better understand the specific requirements placed on portable engines by the districts. Five districts have implemented registration programs specifically for portable engines and associated equipment, in lieu of NSR programs. Owners of portable engines in these districts can register their engines with the district by demonstrating their engines meet specific emission rates. Some air districts specifically exempt portable engines from permit requirements. Ventura County Air Pollution Control District specifically regulates oilfield drilling operations by requiring, if certain criteria are met, the use of electrified drilling equipment. ARB staff's survey also indicated that some districts limit the hours of operation of certain portable operations to minimized localized impacts.

III. SUMMARY OF THE PROPOSED AMENDMENTS TO THE STATEWIDE REGULATION

This chapter complies with Government Code section 11343.2 by providing to the public a "plain English" discussion of the proposed amendments to the Statewide Regulation. Each of the major amendments will be discussed, including changes to the applicability requirements and increased program fees for the Statewide Regulation.

A. REVISIONS TO THE STATEWIDE REGULATION

1. Applicability

Section 2451(c) of the proposed amendments would require portable engines used in certain applications to obtain district approvals, thereby, making the PERP registrations invalid for those uses.

Generators Used to Feed the Grid or to Power Stationary Sources or Equipment

During the energy crisis in 2001, proposals were made to bring in large portable generators to produce electricity to meet the State's energy demands. Also, businesses that had enrolled in programs to curtail energy use in exchange for lower energy rates were asked to reduce their energy consumption. These are known as load reduction programs. In order to maintain production, a number of these facilities brought in portable generators. NOx and diesel PM emission rates from portable engines are from 100 to several hundred times greater than modern power generation facilities. These uses of portable generators without restriction could result in extremely high NOx and diesel PM emissions, which could cause localized air quality and health impacts.

Accordingly, the Executive Officer had to clarify that PERP registered engines were not to be used for these applications, except in cases where an imminent blackout was declared for an area and only for the duration of the blackouts. To provide clarity in the Statewide Regulation and reflect ARB policy, ARB staff is proposing that portable generators used to feed an electrical grid (section 2451(c)(5)(C)) and portable generators used to provide power to a building, a stationary source, or stationary equipment (section 2451(c)(5)(D)) would need to obtain district permits. However, exemptions are allowed in section 2451(c)(5)(D) for the use of the registered generators if there is an unforeseen interruption of electrical power (blackout conditions) from the serving utility and generators used during maintenance and repair operations.

Engines Powering or Mounted on Same Trailer/Skid with Permitted Equipment

ARB staff is proposing in section 2451(c)(5)(E) that PERP registered portable engines that power equipment units permitted by a district or registered engines that are mounted on the same trailer or skid with permitted equipment need to be permitted by the districts. Examples of the associated equipment permitted by the district include boilers, heaters, hot mix asphalt plants, and soil remediation units. ARB staff believes

that the permitted equipment and the portable engines should be evaluated under a single regulatory program; therefore, ARB staff is proposing that portable engines be required to obtain district permits when used to power equipment that is permitted by the districts. The owners of the portable engines can retain and use their PERP registration in other applications.

2. Increased Program Fees

California Health and Safety Code section 41752 authorizes the ARB to implement a fee schedule to collect sufficient fees to administer the PERP. When the original Statewide Regulation became law, the fees were based on an estimated cost to the State to administer the PERP. It was assumed that the staff time required to process each new unit would be 1.5 hours and each renewed unit would be 0.5 hours. This approach significantly underestimated the resources needed to fully process an application and the unique problems inherent to many applications, as well as to administer and manage a program consisting of such a diverse combination of units (includes various types of engines and equipment units) and requirements.

Since the inception of the PERP, staff has processed approximately 5,600 applications for registration representing approximately 25,000 engines and equipment units. A review of resources expended for processing an application reveals actual staff time required is 4 hours to process each new unit and 3 hours for renewal of each unit.

Staff is proposing that the existing fee schedule be increased in an equitable manner such that the program fees will balance current and expected future program costs. It is important to note that no previous fee increase has occurred since the PERP regulation became effective in 1997.

Staff analyzed fees received and expenses incurred over the last five and one half years of the PERP. It was shown that the program had received fees of about $2.5 million dollars and the total expenses were about $6 million dollars. Given the State's current budget crisis, the ARB can no longer subsidize the costs incurred to operate and maintain the PERP. This analysis indicated that even if the workload did not increase, the fees would need to increase by nearly two and one half times for the program to be sustainable. Staff determined the annual average fees received during the last three years of the program (including only those years when renewal fees were received). The three year average annual fee amount received was about $0.5 million dollars. Future expenses were projected to be about $1.5 million dollars per year to account for expected continued growth in the PERP. As a result, the required annual income to match expenses needs to nearly triple. The fee schedule and the difficulty of each associated task were considered in determining the appropriate fee adjustment to achieve a sustainable program.

The major proposed fee changes are for initial application and renewal registrations. Both new and renewed registrations are currently $90 for three years. Staff is proposing that the initial application fee for a new registration be increased to $270 for

three-year registration (or $90 per year) and renewal fees be increased to $225 for a three-year registration (or $75 per year).

Other fees such as change of ownership, registration modification, and renewal penalties are propose to be increased as well. The specific fee increases are listed in Table III-1. A more detailed discussion of the increased program fees is presented in Appendix B.

3. Unpermitted and Exempt Engines

Currently, the Statewide Regulation only allows portable engines in the PERP that meets ARB/U.S. EPA nonroad emission standards (certified engines). The proposed amendments in sections 2456 (d)(5) and 2456(d)(7) would allow existing portable engines operating in California that were previously exempt from district permits and engines that should, but do not have district permits to register in the PERP until December 31, 2005. The intent of the proposed amendments is to encourage owners and operators of exempt and unpermitted engines to seek registration and ultimately bring their engines into compliance with State regulatory requirements. The amendments are also proposed to harmonize with the proposed Portable Engine ATCM, which would require all portable engines greater than 50 horsepower to obtain permits or registration and meet specified fleet average requirements.

In many cases, exempt and unpermitted engines do not meet the requirements for the PERP or the districts' New Source Review requirements and the owners of these engines are left with very few options. After discussions with the CAPCOA Engineering Managers Committee and to provide flexibility to engine owners, ARB staff proposes to allow these engines to register in the PERP until the end of 2005. After that time, only certified engines will be allowed into the program. Once in the program, the owners of these engines will be required to comply with the requirements of the PERP, including the 2010 requirement that engines meet certified nonroad emission standards. The replacement of uncertified engines with cleaner lower emitting certified engines would result in emission reductions of about 1,900 tons of NOx annually and 100 tons of PM annually. In addition, uncertified engines would be subject to annual PM and NOx emission limits of 10 tons per year per district and a daily NOx emission limit of 100 pounds per day.

In workgroup meetings and public consultation meetings, some opposition was encountered from stakeholders who wanted penalties assessed against people who had operated their engines illegally. Since many of these engines do not meet district BACT requirements, they will not be able to obtain

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Table III-1--Current and Proposed PERP Fees

(Fees are per registered unit except where noted otherwise)

1	Initial Registration	~~$90.00~~ 270.00
2	Tactical support equipment, initial registration	
a	Registration of first 25 units (or portion thereof)	~~$1,500.00~~750.00
b	Registration of every additional 50 units (or portion thereof)	~~$1,500.00~~750.00
~~3~~	~~Non-operational portable engines or equipment units~~	
~~a~~	~~Without initial evaluation~~	~~$30.00~~
~~b~~	~~With initial evaluation~~	~~$60.00~~
43	Change of status from non-operational to operational	
a	Where initial evaluation has not been previously completed	~~$60.00~~ 180.00
b	Where initial evaluation has been previously completed	~~$30.00~~ 90.00
~~5~~4	Identical replacement	~~$15.00~~ 75.00
~~6~~	~~Equivalent replacement (treated as a new registration, fees are the same as above for new registration)~~	
~~7~~	~~Renewal~~	
~~a~~5	Renewal ~~E~~every 3 years, non-TSE ~~per registered portable engine or equipment unit~~	~~$90.00~~ 225.00
~~b~~	~~Pro-rated yearly per registered portable engine or equipment unit~~	~~$30.00~~
~~c~~	~~Non-operational 3 years (prorated @ $10/year) per registered portable engine or equipment unit~~	~~$30.00~~
~~d~~	~~Change of status from operational to non-operational plus non-operational renewal~~	~~$45.00~~
~~8~~	~~Renewal for tactical support equipment~~	
~~a~~	~~first 25 units (or portion thereof)~~	~~$750.00~~
~~b~~	~~every additional 50 units (or portion thereof)~~	~~$750.00~~
~~9~~6	Penalty fee for late renewal payments, non-TSE ~~per registered portable engine or equipment unit~~	
a	~~30-60 days after receiving renewal notice~~Postmarked within 2 calendar months prior to registration expiration date	~~$15.00~~ 45.00
b	~~60-90 days after receiving renewal notice~~Postmarked within the calendar month prior to registration expiration date	~~$30.00~~ 90.00
c	~~90 days after receiving renewal notice~~Postmarked after the registration expiration date	~~$45.00~~ 250.00
7	Annual TSE inventory fee	
a	first 25 units (or portion thereof)	$375.00
b	every additional 50 units (or portion thereof)	$375.00
~~10~~8	Modification to registered portable engine or equipment unit	~~$15.00~~ 75.00
~~11~~9	Change of ownership ~~per registered portable engine or equipment unit~~	~~$15.00~~ 75.00
~~12~~10	Replacement of registration identification device	~~$10.00~~ 30.00
11	Correction to an engine or equipment unit description	$45.00
12	Update company information, copy of registration documents	$45.00
13	Copy of registration documents	$45.00
13~~4~~	District inspection fee per registered portable engine or equipment unit inspected	$75.00

* When multiple registered portable engines or equipment units are inspected at a given source, the district inspection fee shall be equal to the lesser of the actual cost, including staff time, for conducting the inspection or $75 per registered portable engine or equipment unit inspected.

district permits. However, ARB staff believes that it is necessary to provide an option to bring these people into a regulatory program so that they can comply with applicable regulatory requirements. ARB staff will make available to the districts a list of people who have registered potentially suspect engines in order for the districts to take appropriate and necessary action.

4. Miscellaneous Revisions

ARB staff is proposing additional minor revisions, which are discussed below.

Under the current Statewide Regulation, operators were able, until July 1, 2001, to replace uncertified engines with equivalent replacement engines of the same emissions and size range. The Statewide Regulation now requires equivalent engine replacements to meet the most stringent nonroad emission standards; therefore, ARB staff is proposing to delete sections 2452(l) and 2453(d) that are applicable to equivalent engine replacements.

ARB staff proposes to clarify that identical engine replacements are allowed only if there is a mechanical breakdown of a registered engine. This will ensure that only legitimate identical engine replacements are allowed to occur. The proposed amendments would add a new definition for mechanical breakdown and add clarifying language to the definition of identical replacements and the engine requirement section (see sections 2452(l) and (q), 2543(c) of the proposed amendments).

Under the current Statewide Regulation, resident engines are no longer allowed in this program as of July 1, 2001 because resident engines do not meet an ARB/U.S. EPA nonroad emission standard. ARB staff proposes to delete or modify the applicable sections for resident engines in sections 2452(gg), 2453(g)(7), and 2456(d)(5) of the proposed amendments).

In the early years of the PERP, non-operational engines were allowed in the program to provide owners/operators the flexibility of registering their uncertified engines before the July 1, 2001 deadline in order to meet future needs. The non-operational engine provision was used sparingly in the early years of the program. Also, ARB staff has not received any applications for non-operational engines in the past few years because only certified engines are currently allowed in the program. ARB staff is proposing to phase out non-operational engines from the program by requiring owners of non-operational engines to make their engines operational. Also, ARB staff will not allow new applications for non-operational engines. The proposed amendments are found in sections 2453(j) and (k).

The Statewide Regulation does not specify the process for change of ownership when a PERP registered engine is sold from one person to another person. Under the proposed amendment, clarification is provided that once a registered engine is sold, the registration would not be valid until the new owner submits a change of ownership application to ARB with applicable fees (see section 2453(m) of the proposed

amendments). At this point, the new owner can operate the portable engine under the PERP.

ARB staff proposes, in section 2456(d)(6), to allow certified on-road diesel engines into the program. The reason is that emission standards for certified on-road diesel-fueled engines are lower than the emission standards for certified diesel-fueled non-road engines. The use of these engines in portable applications may result in potential diesel PM and NOx reductions of approximately 75 and 40 percent, respectively, when compared to a certified nonroad engine.

The proposed amendment to the recordkeeping and reporting requirements are minimal and would improve the enforceability of the Statewide Regulation. ARB staff proposes that the requirement for an annual report to be submitted to the ARB be deleted; however, the reports must be made available to ARB and district staff upon request. Also, the retention time for maintaining the records would be extended from two years to five years to be consistent with the proposed Portable Engine ATCM. Recordkeeping provisions are now required for owners or operators of portable generators used to provide power to a building, stationary source, or stationary equipment during an unforeseen interruption of electrical power from a serving utility. They would have to record daily where the generator was used, the date of operation, and the hours of operation.

ARB staff is proposing that the billing cycle for military tactical support equipment (TSE) be changed from three years to one year in order to simplify the process. TSE in California tend to have a high turnover rate due to TSE entering and leaving the State. Presently, the military bases are on a three-year billing cycle for tactical support equipment registered in the PERP. However, they are required to submit annual reports to the ARB staff updating their inventory of TSE. If their inventory increases, cost adjustments are made to their bills. To align the billing cycle and annual reporting requirement, ARB staff is proposing amendments that will revise the billing cycle to one year rather than three years. This change will make it easier to administer the program for TSE.

The existing Statewide Regulation (section 2466) includes a "sunset" provision where the ARB, in consultation with the California Environmental Protection Agency, determines whether the Statewide Regulation should be retained, revised, or repealed. ARB staff is proposing to remove this provision. Currently, the PERP has registered about half of the portable engines operating in the State. The affected industry has strongly supported the PERP because the program provides them the maximum flexibility to operate a portable engine throughout the State under a single registration, rather than having to obtain permits from multiple districts. In addition, the PERP provides cost savings because the program fees are less costly than a district permit or having multiple district permits. Because of the benefits to businesses operating in California, ARB staff is proposing to delete the sunset provision.

Senate Bill 700, which was signed by Governor Davis on September 22, 2003, removed the provision in State law that exempted agricultural sources from district permitting programs. The current Statewide Regulation has a provision to exclude portable engines used in agricultural operations from registering in the program. ARB staff is proposing to remove the exemption from the Statewide Regulation to provide flexibility to owners/operators of portable agricultural engines to register in the PERP if districts choose to not permit portable agricultural engines.

IV. ENVIRONMENTAL IMPACTS OF THE PROPOSED AMENDMENTS TO THE STATEWIDE REGULATION

This chapter describes the potential environmental impacts of the proposed amendments to the Statewide Regulation. Based on staff's analysis, the proposed amendments to the Statewide Regulation would not result in any adverse impacts.

A. LEGAL REQUIREMENTS APPLICABLE TO THE ENVIRONMENTAL IMPACT ANALYSIS

The California Environmental Quality Act (CEQA) and ARB policy require an analysis to determine the potential environmental impacts of proposed regulations. The Secretary of Resources, pursuant to Public Resources Code section 21080.5, has certified the ARB rulemaking process. Consequently, the CEQA environmental analysis requirements may be included in the Initial Statement of Reasons (ISOR) for this rulemaking. In the ISOR, the ARB must include a functionally equivalent document, rather than adhering to the format described in CEQA of an initial study, a Negative Declaration, and an Environmental Impact Report. In addition, staff will respond, in the Final Statement of Reasons for the amended PERP Regulation, to all significant environmental issues raised by the public during the public review period or at the Board public hearing.

Public Resources Code section 21159 requires that the environmental impact analysis conducted by ARB include the following:

- An analysis of reasonably foreseeable environmental impacts of the methods of compliance;
- An analysis of reasonably foreseeable feasible mitigation measures; and
- An analysis of reasonably foreseeable alternative means of compliance with the amended PERP Regulation.

Regarding mitigation measures, CEQA requires an agency to identify and adopt feasible mitigation measures that would minimize any significant adverse environmental impacts described in the environmental analysis.

B. AIR QUALITY IMPACTS OF THE PROPOSED AMENDMENTS TO THE STATEWIDE REGULATION

The proposed amendment to allow into the PERP portable engines that have been operating in California and were either previously exempt from district permits or should have but were not permitted would have a potential short term air quality impact. The proposed Portable Engine ATCM, if implemented, will impact all portable engines operating in California. Some districts will require owners of the engines to obtain permits. Many engines are the older dirtier engines that will not meet district BACT requirements. Without the proposed amendment, many business owners would have to

purchase new certified engines at a great expense, operate illegally, or close their businesses.

These existing engines are currently operating in the State and the proposed amendment would not create a new market or increase existing emissions. Once in the PERP, the engines will be subject to daily and annual emission limits, which would minimize their emission impacts. In addition, uncertified engines would have to comply with the 2010 requirement, where portable engines have to meet ARB/U.S. EPA nonroad emission standards. ARB staff estimated that the replacement of uncertified engines with certified engines would result in 1,900 tons per year of NOx reductions and 100 tons per year of diesel PM emissions reductions.

ARB staff is proposing that certified on-road diesel engines be allowed to register into the PERP. Current emission standards for on-road diesel-fueled engines are lower than the standards for diesel-fueled non-road engines. The use of on-road diesel engines in portable applications would result in lower PM and NOx emissions compared to a non-road engine operated the same number of hours, load, and conditions. Table IV-1 shows the NOx and diesel PM emission standards in grams per brake horsepower-hour (g/bhp-hr) for a 2000 model year 500 brake-horsepower (bhp) engine. The diesel on-road engine has lower PM and NOx emission standards by about 75 percent and 40 percent, respectively, compared to the standards for a similar size diesel non-road engine. ARB staff believes that this amendment would not result in any adverse environmental impacts.

Table IV-1
On-Road and Non-Road Emission Standards For A
500 Horsepower Diesel Engine

2000- model year engine	NOx (g/bhp-hr)	PM (g/bhp-hr)
On-road	4.0	0.10
Non-road	6.9	0.40

C. IMPACTS OF THE PROPOSED AMENDMENTS ON MEETING AMBIENT AIR AUQLITY STANDARDS

HSC section 41754 requires that emissions from engines and equipment units registered in the PERP shall not, in aggregate, interfere with the attainment or maintenance of the State and federal ambient air quality standards. ARB staff believes that the proposed amendments to the Statewide Regulation would not impede or cause any of the ambient air quality standards to be exceeded. The proposed amendments are expected to result in positive air quality benefits.

The implementation of the current Statewide Regulation results in reductions of NOx, ROG, and diesel PM emissions from portable engines in future years due to the 2010 requirement that all registered engines have to meet certified emission standards.

D. ANALYSIS OF REASONABLY FORESEEABLE ENVIRONMENTAL IMPACTS OF THE METHODS OF COMPLIANCE

As specified in Health and Safety Code section 41755, the districts are responsible for enforcing the requirements of the Statewide Regulation. If the Board approves the proposed amendments, the districts would continue to enforce the amended Statewide Regulation.

Compliance with the proposed amendments is expected to directly impact air quality alone and not other environmental media such as water or soil. The only reasonably foreseeable impact on other environmental media (i.e., water, soil, or hazardous waste disposal) would be a consequence of the air quality impact. One of the proposed amendments would allow portable engines that were previously exempt from district permits and engines that were required to be permitted by the districts, but have not done so, to register in the PERP. Once in the program, operators would be subject to the daily and annual emission limits and the 2010 requirement that uncertified engines be replaced with certified engines. Compliance with the 2010 requirement is reasonable because all new nonroad diesel-fueled engines sold in California since 1996 have been required to meet ARB/U.S. EPA emission standards. Because certified engines are less polluting, the use of these engines would result in less of an environmental impact.

E. REASONABLY FORESEEABLE MITIGATION MEASURES

CEQA requires an agency to identify and adopt feasible mitigation measures that would minimize any significant adverse environmental impacts described in the environmental analysis. ARB staff has concluded that no significant adverse environmental impact would occur from adoption of, and compliance with, the proposed amendments to the Statewide Regulation. Therefore, no mitigation measures would be necessary.

F. REASONABLY FORESEEABLE ALTERNATIVE MEANS OF COMPLIANCE WITH THE PROPOSED AMENDMENTS

The proposed amendments are intended to align the Statewide Regulation with the proposed Portable Engine ATCM, provide consistency with ARB policy on power generation, provide clarity and enforceability for the PERP, and provide sufficient funding to ensure that the PERP can be maintained at the current level of efficiency. ARB staff has concluded that the proposed amendments provide the most effective and least burdensome approach to ensuring air quality continues to be protected, that ARB can continue to operate and maintain the program effectively, and the program harmonizes with the proposed Portable Engine ATCM.

G. ENVIRONMENTAL JUSTICE

The ARB is committed to integrating environmental justice in all of its activities. On December 13, 2001, the Board approved "Policies and Actions for Environmental Justice," which formally established a framework for incorporating Environmental Justice into the ARB's programs, consistent with the directive of California state law. Environmental Justice is defined as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. These policies apply to all communities in California, but recognize that environmental justice issues have been raised more in the context of low-income and minority communities.

The Environmental Justice Policies are intended to promote the fair treatment of all Californians and cover the full spectrum of the ARB's activities. Underlying these policies is a recognition that the agency needs to engage community members in a meaningful way as it carries out its activities. People should have the best possible information about the air they breathe and what is being done to reduce unhealthful air pollution in their communities. The ARB recognizes its obligation to work closely with all communities, environmental and public health organizations, industry, business owners, other agencies, and all other interested parties to successfully implement these Policies.

During the process to develop the proposed amendments, the ARB staff proactively identified and contacted representatives from engine and diesel emission control associations, portable fleet owners and associations, environmental organizations, and other parties interested in portable engines. These individuals participated by providing data, reviewing draft regulations, and attending public forum meetings, in which staff directly addressed their concerns.

V. ECONOMIC IMPACTS OF STATEWIDE REGISTRATION PROGRAM

This chapter discusses legal requirements that must be satisfied in analyzing the economic impacts of the proposed amendments to the Statewide Regulation, the methodology used to estimate cost impacts, and presents estimates of the economic impacts for the proposed amendments. The proposed amendments to the Statewide Regulation are not expected to change the PERP's overall beneficial impact on affected business and industry.

A. SUMMARY OF THE ECONOMIC IMPACTS

Staff estimates the total potential economic impact of the proposed amendments to the Statewide Regulation to affected businesses and governmental agencies is approximately 2.2 million dollars. The total economic impact is attributable to cost for increased renewal and administrative fees ($1.4 million dollars); for uses of portable engines having to obtain district permits ($415,000); to purchase hour meters ($79,000); increase in recordkeeping requirements ($301,000) and registration of non-operational units ($30,000). However, ARB staff expects there to remain an overall benefit for most businesses affected by the proposed amendments to the Statewide Regulation compared to having to obtain district permits (see Appendix C, Table 1 for the individual work sheets).

B. LEGAL REQUIREMENTS

Section 11346.3 of the Government Code requires State agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulation. The assessment shall include a consideration of the impact of the proposed regulation on California jobs, business expansion, elimination or creation, and the ability of California business to compete with businesses in other states.

Also, State agencies are required to estimate the cost or savings to any State or local agency and school district in accordance with instructions adopted by the Department of Finance (DOF). The estimate shall include any non-discretionary cost or savings to local agencies and the cost or savings in federal funding to the State.

Finally, HSC section 57005 requires the ARB to perform an economic impact analysis of submitted alternatives to a proposed regulation before adopting any major regulation. A major regulation is defined as a regulation that will have a potential cost to California business enterprises in an amount exceeding ten million dollars in any single year. Because the estimated cost of the amendments to the PERP regulation does not exceed ten million dollars in a single year, the proposed amended Regulation is not a major regulation.

C. METHODOLOGY FOR ESTIMATING COSTS ASSOCIATED WITH IMPLEMENTATION OF THE PROPOSED AMENDMENTS

This section provides the general methodology and assumptions used to estimate the costs associated with the amendments to the Statewide Regulation. ARB staff describes the method used to estimate the number and types of engines and associated equipment subject to the proposed increased program fees. The basic methodology is also used to analyze the costs to private companies and governmental agencies. For determining the various costs for the life of the regulation, staff followed the instructions found in the State Administrative Manual, Section 6680 and utilized the annual cost multiplied out five years.

1. Analysis of the PERP Database

In evaluating the cost impacts from the proposed amendments to the Statewide Regulation for federal, state, local agencies and small businesses, ARB staff conducted an analysis of the PERP database. This analysis was conducted on September 19, 2003. Based on the analysis, staff determined that there are over 1,350 "companies" with 22,146 engines or equipment (units) registered in the PERP. Of these "companies", there are nine (9) State agencies with 270 registered units, 103 local agencies with 769 registered units, 41 federal agencies with 5,368 registered units, and 1,205 private businesses with 15,739 registered units. These percentages are used to determine the cost of the proposed amendments to the various "companies."

Staff also used a representative sample of businesses to determine the percentage of "small businesses." Based on this analysis, staff determined that 70 percent of all businesses currently in the PERP are small businesses and own five or fewer units.

2. Initial and Recurring Costs

The cost evaluation considers both initial costs and ongoing annual costs. Initial costs were applied to the estimated number of units that would have to obtain district permits for engines that can be no longer be utilized in certain applications, and the cost to purchase hour meters. Because the number of engines and associated equipment in the program varies over time, staff based the increased cost due to the proposed fee schedule on the annual average number of units registered during the three-year period from 2000 through 2002. The three-year average number of units was then multiplied by the new fee schedule and then compared to the amount of fees received during this same three-year period to determine the increase. For TSE equipment, staff utilized the three-year average of fees received and assumed a 1.5 multiplier to determine the increased cost.

D. BUSINESSES AFFECTED

Any business that owns or operates portable internal combustion engines and/or equipment units currently registered is the PERP is affected by the proposed amendments. In addition, any business that owns or operates portable internal combustion engines and equipment units in California may be potentially affected by the proposed amendments. The affected businesses fall into different industry classifications. A list of the industries that may be impacted is provided in Table V-1.

E. COST DUE TO INCREASED ADMINISTRATIVE AND RENEWAL FEES

The amendments to the Statewide Regulation include increased registration, administrative, and renewal fees. The proposed fee schedule is found in Appendix C, Table 2. Discussions of the economic impacts associated with the increased fees are as follows:

1. Registration Fee Increase

Though there is an increase in the initial registration fees, staff assumed that owners/operators currently with registered engines and associated equipment units in the PERP will not be affected by the increase in registration fees since their units are already in the program.

2. Renewal and Administrative Fees Increase

The total potential economic impact due to increased renewal and administrative fees as a result of the proposed amendments for engines and associated equipment currently in the PERP is approximately $1.38 million dollars. Because the program is voluntary, total potential economic impact is calculated by multiplying the annual cost out five years and adding any one-time fees. Staff estimates that the cost for the increased renewal and administrative fees in the proposed amendments for engines and associated equipment currently in the program to be approximately $277,000 per year. The cost analysis table is included in Appendix C, Table 3.

3. Uses of Portable Engines Requiring District Permits

The total potential economic impact due to owners/operators having to obtain district permits for some applications is estimated to be approximately $415 thousand dollars. Because the program is voluntary, total potential economic impact is calculated by multiplying the annual cost for having to obtain permits for five years and adding any one-time fees (see Appendix C, Table 4).

The amendments to the Statewide Regulation specify certain uses of portable engines and equipment units to require permits from the districts. Staff assumes owners of engines and associated equipment currently in the program will retain their registration and would either choose not to use portable equipment for the restricted activities or

Table V-1

Industries Affected by Statewide Registration programmers	
SIC Code	Industry
1311	Crude petroleum and natural gas
1321	Natural gas liquids
1381	Drilling oil and gas wells
1382	Oil and gas exploration services
1389	Oil and gas field services, not elsewhere classified
1521	Single-family housing construction
1522	Residential construction, not elsewhere classified
1531	Operative builders
1541	Industrial buildings and warehouses
1542	Nonresidential construction, not elsewhere classified
1611	Highway and street construction
1622	Bridge, tunnel, and elevated highway
1623	Water, sewer, and utility lines
1629	Heavy construction, not elsewhere classified
1711	Plumbing, heating, air-conditioning
1771	Concrete work
1781	Water well drilling
1791	Structural steel erection
1794	Excavation work
1795	Wrecking and demolition work
4925	Gas production and/or distribution
4941	Water supply
4952	Sewerage systems
4953	Refuse systems
4959	Sanitary services, not elsewhere classified
4961	Steam and air-conditioning supply
4971	Irrigation systems
7349	Building maintenance services, not elsewhere classified
7353	Heavy construction engines and equipment units rental
7359	Equipment rental and leasing, not elsewhere classified
7519	Utility trailer rental
7812	Motion picture and video production
7819	Services allied to motion pictures
7996	Amusement parks
9711	National security

apply for a district permit. Staff estimated the total cost to obtain permits to use engines for certain activities is about $83,000 for permitting fee and approximately $83,000 thereafter for annual permit renewal fees.

District permitting and renewal fees vary widely depending on the district. A survey of districts indicated permitting costs for a 500 BHP portable engine ranged from $150 to $2,167, while renewal fees ranged from $90 to $1,012 (see Appendix C, Table 5). For the analysis, staff assumed an initial permit fee of $750 and an annual renewal fee of $750 per engine. Staff assumed a cost impact if one-half of one percent (0.05%) of the units (111 units) may need district permits (in addition to maintaining PERP registration).

Staff also believes that the cost increases associated with the proposed amendments to the regulation are less than the costs associated with obtaining and maintaining multiple district permits. Staff surveyed the districts to determine permitting and renewal costs over a three-year period and compared it to the cost for registration and renewal in the PERP. Based on the survey results, permitting and registration in multiple districts is greater than the cost from the increased fees from the proposed amendments (see Appendix C, Table 4). In addition, the PERP's standardized emission limits, monitoring, and recordkeeping requirements allow for consistency for which engine and associated equipment owners also realize a cost saving. Because the PERP is a voluntary program, eligible businesses and government agencies that find it is not financially advantageous and administratively convenient will obtain district permits.

4. Increased Recordkeeping

The total potential economic impacts due to owners/operators having to maintain records of engines used during an emergency situation is estimated to be $301,000. Because the program is voluntary, total potential economic impact is calculated by multiplying the annual cost for having to obtain records each year for five years.

As proposed, the PERP would require recordkeeping for engines used during an emergency. Staff assumed annual costs of $100 per emergency engine for owners to record, maintain, and report to the district when required. ARB staff believes this is a conservative assumption since many companies already keep these records. Staff also assumed that as a conservative estimate, ten percent of the 6,013 generators currently registered in the program would be used in an emergency and, therefore; be required to maintain records. Based on this estimate, 601 engines would be used each year for a total cost of $60,100 per year for recordkeeping costs (see Appendix C, Table 5).

The proposed changes to the PERP also require that records be maintained for a period of five years from the current requirement to maintain records for 2 years. However, the requirement to submit these records in the form of annual reports to the ARB each year has been removed. Staff assumed that there is no net increase in costs to retain

the records longer because of the savings of no longer having to assemble and send the data to AF[illegible]. Therefore, staff did not include a cost increase for the increased record retention time.

5. Non-Operational Units

The total potential economic impact due to some owners/operators having to register units and renew the registration is estimated to be approximately $29,610. There are currently 54 non-operational units in the PERP. Of these 54 units, 50 units have not had an engineering evaluation performed, while 4 units had an engineering evaluation completed. The proposed amendments require that that these units either be registered as operational units in the PERP, obtain district permits, or removed from the program. If these units are removed from the program there is no increased cost. If these units are registered into the PERP, fees for registration would be $180 per engine for the 50 units without an initial engineering evaluation, and $90 for 4 units with initial engineering evaluations completed as a one-time fee. The total cost to register the non-operational units would be $9,360. These units must also renew their registration 1.66 times over the course of the five-year cumulative period. Cost for three years is $225 or $75 per year per unit or $20,250 for the cumulative five-year period (See Appendix C, Table 7).

6. Installation of Hour Meters

The total potential economic impact due to some owners/operators having to purchase hour meters is estimated to be approximately $79,000 dollars as a one-time fee. Currently there are 6,013 reported generators currently registered in the PERP. Of these, 5,199 units are reported to have hour meters and 814 units do not have meters. The amendments to the Statewide Regulation require that electrical generation generators used during an emergency maintain records of the number of hours used during the emergency period. In order to maintain these records, ARB staff assumed that some units will need to install hour meters. As a conservative estimate, ARB staff assumed that half of the generators currently without hour meters (407 generators) will be used for emergency operations and will retrofit with an hour meter. A quartz hour meter can be purchased and installed at a cost of $195 each. The hour meter may also be useful to properly identify maintenance schedules for the engine and may save the owner/operator money (see Appendix C, Table 8).

F. POTENTIAL IMPACTS ON EMPLOYMENT

The proposed amendments to the Statewide Regulation are not expected to cause a noticeable change in California employment.

G. POTENTIAL IMPACTS ON BUSINESS CREATION, ELIMINATION, OR EXPANSION

The majority of the increases costs would be borne by engine owners and government agencies, although some costs may be passed onto individuals from companies such as rental yards, and companies that contract directly with individuals. Overall, most affected businesses and government agencies would be able to absorb the costs of the proposed regulation with no significant adverse impacts. Because the proposed amendments to the Statewide Regulation would not significantly alter the profitability of most businesses, a noticeable change in employment, business creation, elimination, or expansion, and business competitiveness in California is not expected.

The proposed amendments to the Statewide Regulation maintain a benefit to California businesses due to the streamlined permitting process, standardized emissions limits, and lower overall cost compared to obtaining and maintaining multiple district permits.

H. POTENTIAL IMPACTS ON SMALL BUSINESSES

The total potential economic impact to small business is approximately $1.1 million dollars. Because the program is voluntary, total potential economic impact from the amendments is calculated by multiplying the annual cost out five years and adding any one-time fees. The cost impacts included increased administrative and renewal fees, as well as district permitting and renewal fees for business owners/operators who would be required to obtain district permits for certain uses of their portable engines. The cost to small business was estimated to be approximately $220,000 annually (see Appendix C, Table 9).

To determine the number of small business staff relied on the following definition of small business. (As defined in Assembly Bill 2505 (Ch. 821, Statutes of 1998); the statute sets forth a simplified definition of small business that is utilized for State procurement activities):

> "Small Business" means an independently owned and operate business, which is not dominant in its field of operation, the principal of which is located in California, the offices of which are domiciled in California, and which, together with affiliates, has 100 or fewer employees, and average annual gross receipts of ten million dollars ($10,000,000) or less over the previous three years, or is a manufacturer with 100 or fewer employees."

I. POTENTIAL IMPACTS ON STATE AND LOCAL AGENCIES

The total potential economic impact to state agencies is approximately $27,000. The total potential economic impact to local agencies is approximately $76,000. Because the program is voluntary, the total potential economic impact is calculated by multiplying the annual cost out five years and adding any one-time fees. The cost impact includes increased administrative and renewal fees, permitting fees, hour meter, registration and

renewal of non-operational units and recordkeeping fees. Staff determined the annual cost impact for administrative, renewal, district permitting, hour meter installation, registration on renewal of non-operational units, and increased recordkeeping for State owned units to be approximately $5,482 and approximately $15,611 for local agencies (see Appendix C, Table 9).

Appendix A:

PROPOSED AMENDED REGULATION TO ESTABLISH A STATEWIDE PORTABLE EQUIPMENT REGISTRATION PROGRAM

Regulation to Establish a Statewide Portable Equipment Registration Program (As Adopted December 10, 1998, with Amendments)

California Air Resources Board

Article 5 and sections 2459 –, 2460, 2461, 2462, 2463, 2464, 2465, 2466, Title 13, California Code of Regulations

(Note: Proposed amendments to the regulation are identified below. Underline is used to indicate the proposed additions. ~~Strikeout~~ is used to indicate proposed deletions from the regulation text.)

Article 5. Portable Engine and Equipment Registration

§ 2450. Purpose.

These regulations establish a statewide program for the registration and regulation of portable engines and engine-associated equipment (portable engines and equipment units) as defined herein. Portable engines and equipment units registered under the

Air Resources Board program may operate throughout the State of California without authorization (except as specified herein) or permits from air quality management or air pollution control districts (districts). These regulations preempt districts from permitting, registering, or regulating portable engines and equipment units, including equipment necessary for the operation of a portable engine (e.g. fuel tanks), registered with the Executive Officer of the Air Resources Board except in the circumstances specified in the regulations.

NOTE: Authority cited: Section 39600-, 39601, 41752-, 41753, 41754, 41755, 43013(b), and 43018, Health and Safety Code. Reference: Sections 41750-, 41751, 41752, 41753, 41754, 41755, Health and Safety Code.

§ 2451. Applicability.

(a) Except for (d) of this section, registration under this regulation is voluntary for owners and operators of portable engines or equipment units.

(b) This regulation applies to portable engines and equipment units as defined in section 2452. Except as provided in paragraph (c) of this section, any portable engine or equipment unit may register under this regulation. Examples include, but are not limited to:

(1) portable equipment units driven solely by portable engines including confined and unconfined abrasive blasting, Portland concrete batch plants, sand and gravel screening, rock crushing, and unheated pavement recycling and crushing operations;

(2) consistent with section 209 (e) of the federal Clean Air Act, engines and associated equipment used in conjunction with the following types of portable operations: well drilling, service or work-over rigs; power generation, excluding cogeneration; pumps; compressors; diesel pile-driving hammers; welding; cranes; woodchippers; dredges; equipment necessary for the operation of portable engines and equipment units; and military tactical support equipment.

[Note: Under section 209 (e)(1) of the federal Clean Air Act [42 U.S.C. 7543 (e)(1)], California is preempted from establishing emission standards or other requirements related to the control of emissions (other than in-use operational

controls) for new engines under 175 horsepower used in farm and construction operations, as defined by the U.S. EPA in 40 Code of Federal Regulations (CFR) Part 85, Subpart Q, Section 85.1601 et seq. [see 59 Fed. Reg. 36969 (July 20, 1994)]. ~~Federal preemptions should only affect engines less than 175 brake horsepower used in construction operations because California law exempts agricultural operations from permit and registration programs as stated in section (c)(2) below. Accordingly, references to the federal preemptions as they apply to this regulation will refer to requirements for construction equipment using engines less than 175 brake horsepower.~~
See *Engine Manufacturers Association* v. *EPA* (88 F.3d 1075 [D.C. Cir. 1996]). Under section 209 (e)(2) [42 U.S.C. 7543 (e)(2)] of the CAA, California is required to receive authorization from the U.S. EPA prior to enforcing its regulations for nonroad equipment not otherwise preempted under section 209 (e)(1). See *Engine Manufacturer's Association*, (supra). To date, ARB has received authorization for regulations covered in Title 13, California Code of Regulations sections 2400~~-~~, 2401, 2402, 2403, 2404, 2405, 2406, 2407 (see 54 Fed. Reg. 37440 [July 20, 1995]) and sections 2420~~-~~, 2421, 2422, 2423, 2424, 2425, 2426, 2427 (see 59 Fed. Reg. 48981 [September 21, 1995]).]

(c) The following are not eligible for registration under this program:

(1) any engine used to propel mobile equipment or a motor vehicle of any kind;

~~(2) any portable engine or equipment unit used exclusively in agricultural operations as defined in California Health and Safety Code section 42310 (e);~~

(~~3~~2) any engine or equipment unit not meeting the definition of portable as defined in section 2452 (x) of this regulation;

~~(4) any equipment unit determined by the Executive Officer to qualify as part of a stationary source permitted by a district;~~

(~~5~~3) any portable engine or equipment unit subject to an applicable federal Maximum Achievable Control Technology standard, or National Emissions Standard for Hazardous Air Pollutants, or federal New Source Performance Standard, except for equipment units subject to 40 CFR Part 60 Subpart OOO (Standards of Performance for Nonmetallic Mineral Processing Plants);

(~~6~~4) any portable engine or equipment unit operating within the boundaries of the California Outer Continental Shelf (OCS). [Note: This shall not prevent statewide registration of engines and equipment units already permitted by a district for operation in the OCS. Such statewide registration shall only be valid for operation onshore and in State Territorial Waters (STW).];

(5) operation of an engine or equipment unit at any location determined by the Executive Officer to require permits from a district. Examples include but are not limited to:

~~(7)~~ (A) any dredging operation in the Santa Barbara Harbor; ~~and~~

~~(8)~~ (B) any dredging unit owned by a single port authority, harbor district, or similar agency in control of a harbor, and operated only within the same harbor;

(C) generators used for power production into the grid;

(D) generators used to provide primary or supplemental power to a building, facility, stationary source, or stationary equipment, except during unforeseen interruptions of electrical power from the serving utility, maintenance and repair operations, and remote operations where grid power is unavailable. For interruptions of electrical power, the operation of a registered generator shall not exceed the time of the actual interruption of power; ~~and~~

(E) engines that provide power to or that are mounted on the same trailer or skid with equipment that is ineligible for registration and subject to district permits, including but not limited to: boilers, heaters, hot mix asphalt plants, and soil remediation units.

(F) any equipment unit determined by the Executive Officer to qualify as part of a stationary source permitted by a district, and its associated engine.

(d) In the event that the owner or operator of a portable engine or equipment unit elects not to register under this program, the unregistered portable engine or equipment unit shall be subject to district permitting requirements pursuant to district regulations. ~~However, registration under this program is mandatory for those portable engines rated at 50 brake horsepower or greater that are located in a district having a permit or registration program that establishes emission standards or emission limits applicable to portable engines, and the Executive Officer has determined that the district program has been preempted by federal law.~~

~~(1) For the purpose of this provision, a permit or registration program applicable to portable engines is defined as a program which establishes emission control technology requirements, in-use operational controls (e.g., daily or annual emission limits), or proposed control measures contained in the State Implementation Plan.~~

~~(2) Upon determining that a district program has been preempted as to specific engines by the federal Clean Air Act, the Executive Officer will issue an Executive Order setting forth such findings. Affected owners and/or operators of portable engines will be notified within 30 days by the ARB and/or districts of the issuance of the Executive Order and shall, within 180 days of issuance of the Executive Order, submit an application for registration under this regulation. An owner or operator of portable engines that are required to register pursuant to this section may elect to use current daily and annual emission limit permit conditions of the district in which the portable engine is to be operated, in place of the daily~~

~~and annual requirements of this regulation. Any daily and hourly emission limits of a district that are used in lieu of this regulation's limits are only valid during operation in that district. If the engine is operated in a district that previously did not have a permit program, the daily and annual requirements of this regulation will apply. All other requirements of this regulation are applicable to the portable engine.~~

NOTE: Authority cited: Sections 39600~~-~~, 39601, 41752~~-~~, 41753, 41754, 41755, 43013(b) and 43018, Health and Safety Code. Reference: Sections 41750~~-~~, 41751, 41752, 41753, 41754, 41755, Health and Safety Code.

§ 2452. Definitions.

(a) **Air Contaminant** means any discharge, release, or other propagation into the atmosphere which includes, but is not limited to, smoke, dust, soot, grime, carbon, fumes, gases, odors, particulate matter, acids, or any combination thereof.

(b) **ARB** means the California Air Resources Board.

(c) **Construction Equipment** means equipment that uses an engine and that is primarily used (as defined below) in construction and operated at commercial construction sites.

(d) **Corresponding Onshore District** means the district which has jurisdiction for the onshore area that is geographically closest to the engine or equipment unit.

(e) **District** means an air pollution control district or air quality management district created or continued in existence pursuant to provisions of Part 3 (commencing with section 40000) of the California Health and Safety Code.

(f) **Emergency** means any situation arising from sudden and reasonably unforeseen natural disaster such as earthquake, flood, fire, or other acts of God, or other unforeseen events beyond the control of the portable engine or equipment unit operator, its officers, employees, and contractors that threatens public health and safety and that requires the immediate temporary operation of portable engines or equipment units to help alleviate the threat to public health and safety.

(g) **Engine** means any piston driven internal combustion engine.

(h) **Equipment Unit** means equipment that emits ~~air contaminants~~PM_{10} over and above ~~those~~that emitted from ~~the~~an associated portable engine~~ and is associated with, and driven solely by, any portable engine. Equipment units may include equipment necessary for the operation of a portable engine (e.g., fuel tanks)~~.

~~(i) **Equivalent Replacement** means a substitution of one or more registered portable engine(s) or equipment unit(s) with a portable engine or equipment unit that is intended to perform the same or similar function as the original portable engine or equipment unit, and where the following conditions exist:~~

~~(1) the replacement engine or equipment unit results in equal or lower air contaminant emissions than the existing engine or equipment unit (or sum of existing engines or equipment units) expressed as a mass per unit time (limitations on capacity or hours of operation shall not be taken into account in qualifying for lower air contaminant emissions);~~

~~(2) the replacement engine or equipment unit meets the emission control technology requirements of this article contained in sections 2456 and 2457;~~

~~(3) the rated brake horsepower of the replacement engine does not exceed the rated brake horsepower of the existing engine (or sum of existing engines) by more than 20 percent. For every percentage point increase of the rated brake horsepower, there shall be an associated decrease in emissions of nitrogen oxides, expressed as a mass per unit time, equal to or exceeding two percentage points; and~~

~~(4) the manufacturer's maximum rated capacity of the replacement equipment unit does not exceed the maximum rated capacity of the existing equipment unit.~~

(~~j~~i) **Executive Officer** means the Executive Officer of the California Air Resources Board or his designee.

(~~k~~j) **Farm Equipment** means equipment that uses an engine and that is primarily used (as defined below) in the commercial production and or commercial harvesting of food, fiber, wood, or commercial organic products or in the processing of such products for further use on a farm.

(~~l~~k) **Hazardous Air Pollutant (HAP)** means any air contaminant that is listed pursuant to section 112(b) of the federal Clean Air Act.

(~~m~~l) **Identical Replacement** means a substitution due to mechanical breakdown of a registered portable engine or equipment unit with another portable engine or equipment unit that has the same manufacturer, type, model number, manufacturer's maximum rated capacity, and rated brake horsepower; and is intended to perform the same or similar function as the original portable engine or equipment unit; and has equal or lower emissions expressed as mass per unit time; and meets the emission control technology requirements of sections 2455 through 2457 of this article.

(~~n~~m) **Location** means any single site at a building, structure, facility, or installation.

(~~o~~n) **Maximum Achievable Control Technology (MACT)** means any federal requirements promulgated as part of 40 CFR Parts 61 and 63.

(~~p~~o) **Maximum Rated Capacity** is the maximum throughput rating or volume capacity listed on the nameplate of the portable equipment unit as specified by the manufacturer.

(~~q~~p) **Maximum Rated Horsepower (brake horsepower (bhp))** is the maximum brake horsepower rating specified by the portable engine manufacturer and listed on the nameplate of the portable engine.

(q) **Mechanical Breakdown** means any failure of an engine's electrical system or mechanical parts that necessitates the removal of the engine from service.

(r) **Modification** means any physical change in portable engine or equipment unit method of operation, or an addition to an existing portable engine or equipment unit, which may cause or result in the issuance of air contaminants not previously emitted. Routine maintenance and/or repair shall not be considered a physical change. Unless previously limited by an enforceable registration condition, a change in the method of operation shall not include:

(1) an increase in the production rate, unless such increase will cause the maximum design capacity of the portable equipment unit to be exceeded;
(2) an increase in the hours of operation;
(3) a change of ownership; and
(4) the movement of a portable engine or equipment unit from one location to another;

(s) **New Nonroad Engine** means a domestic or imported nonroad engine, the equitable or legal title to which has never been transferred to an ultimate purchaser. If the equitable or legal title to an engine is not transferred to an ultimate purchaser until after the engine is placed into service, then the engine will no longer be new after it is placed into service. A nonroad engine is placed into service when it is used for its functional purposes. The term "ultimate purchaser" means, with respect to a new nonroad engine, the first person who in good faith purchases a new nonroad vehicle or a new nonroad engine for purposes other than resale.

(t) **New Source Performance Standard** means any federal requirement promulgated as part of 40 CFR Part 60.

(u) **Non-operational** means a portable engine or equipment unit that an owner or operator has demonstrated to the satisfaction of the Executive Officer as residing

in California but not operating. A portable engine or equipment unit determined to be non-operational may not operate under the registration program.

(v) **Nonroad Engine** means:

(1) Except as discussed in paragraph (2) of this definition, a nonroad engine is any engine:

(A) in or on a piece of equipment that is self-propelled or serves a dual purpose by both propelling itself and performing another function (such as garden tractors, off-highway mobile cranes and bulldozers); or

(B) in or on a piece of equipment that is intended to be propelled while performing its function (such as lawnmowers and string trimmers); or

(C) that, by itself or in or on a piece of equipment, is portable or transportable, meaning designed to be and capable of being carried or moved from one location to another. Indicia of transportability include, but are not limited to, wheels, skids, carrying handles, dolly, trailer, or platform.

(2) An engine is not a nonroad engine if:

(A) the engine is used to propel a motor vehicle or a vehicle used solely for competition, or is subject to standards promulgated under section 202 of the federal Clean Air Act; or

(B) the engine is regulated by a federal New Source Performance Standard promulgated under section 111 of the federal Clean Air Act; or

(C) the engine otherwise included in paragraph (1)(C) of this definition remains or will remain at a location for more than 12 consecutive months or a shorter period of time for an engine located at a seasonal source. Any engine (or engines) that replaces an engine at a location and that is intended to perform the same or similar function as the engine replaced will be included in calculating the consecutive time period. An engine located at a seasonal source is an engine that remains at a seasonal source during the full annual operating period of the seasonal source. A seasonal source is a stationary source that remains in a single location on a permanent basis (at least two years) and that operates at that single location approximately three (or more) months each year.

(w) **Outer Continental Shelf (OCS)** shall have the meaning provided by section 2 of the Outer Continental Shelf Lands Act (43 U.S.C. Section 1331 et seq.).

(x) **Portable** means designed and capable of being carried or moved from one location to another. Indicia of portability include, but are not limited to, wheels, skids, carrying handles, dolly, trailer, or platform. For the purposes of this regulation, dredge engines on a boat or barge are considered portable. The engine or equipment unit is not portable if any of the following are true:

(1) the engine or equipment unit or its replacement is attached to a foundation, or if not so attached, will reside at the same location for more than 12 consecutive months. Any engine or equipment unit such as back-up or stand-by engines or equipment units, that replace engine(s) or equipment unit(s) at a location, and is intended to perform the same or similar function as the engine(s) or equipment unit(s) being replaced, will be included in calculating the consecutive time period. In that case, the cumulative time of all engine(s) or equipment unit(s), including the time between the removal of the original engine(s) or equipment unit(s) and installation of the replacement engine(s) or equipment unit(s), will be counted toward the consecutive time period; or

(2) the engine or equipment unit remains or will reside at a location for less than 12 consecutive months if the engine or equipment unit is located at a seasonal source and operates during the full annual operating period of the seasonal source, where a seasonal source is a stationary source that remains in a single location on a permanent basis (at least two years) and that operates at that single location at least three months each year; or

(3) the engine or equipment unit is moved from one location to another in an attempt to circumvent the portable residence time requirements.

[Note: The period during which the engine or equipment unit is maintained at a storage facility shall be excluded from the residency time determination.]

(y) **Prevention of Significant Deterioration (PSD)** means any federal requirements promulgated as part of 40 CFR Part 52.

(z) **Primarily Used** is a determination by U.S. EPA under section 209 (e) of the federal Clean Air Act, that 51 percent or more of a specific type of engine or equipment, with an engine under 175 maximum brake horsepower rating, is used in the farm and construction industries.

(aa) **Process** means any air-contaminant-emitting activity associated with the operation of a portable engine.

(bb) **Project, for the purposes of onshore operation,** means the use of one or more registered portable engines or equipment units operated at one location under the same or common ownership or control to perform a single activity.

(cc) **Project, for the purposes of State Territorial Waters (STW),** means the use of one or more registered portable engines and equipment units operating under the same or common ownership or control to perform any and all activities needed to fulfill specified contract work that is performed in STW. For the purposes of this definition, a contract means verbal or written commitments covering all operations necessary to complete construction, exploration, maintenance, or other work. Multiple or consecutive contracts may be considered one project if they are intended to perform activities in the same general area, the same parties are involved in the contracts, or the time period specified in the contracts is determined by the Executive Officer to be sequential.

(dd) **Registration** means issuance of a certificate by the Executive Officer acknowledging expected compliance with the applicable requirements of this article, and the intent by the owner or operator to operate said portable engine or equipment unit within the requirements established by this article as it pertains to portable engines and equipment units.

(ee) **Rental Business** means a business in which the principal use of its engines or equipment units is to temporarily rent or lease for profit, portable engines or equipment units to operators other than the owner(s) of the engine or equipment unit.

(ff) **Renter** means a person who rents a portable engine or equipment unit from a rental business.

(gg) **Resident Engine** means:

(1) a portable engine that at the time of applying for registration, has a current, valid district permit or registration issued in accordance with local district requirements, and an application for registration is submitted to the Executive Officer <u>on or</u> before ~~July 1, 2001~~ <u>December 31, 2005</u> or

(2) a portable engine that resided <u>and operated</u> in the State of California at any time during calendar year ~~1995~~ 2003 and an application for registration is submitted to the Executive Officer no later than ~~July 1, 2000~~ <u>December 31, 2005</u>; or

(3) a portable engine where registration becomes mandatory pursuant to section 2451 (d) of this article.

[Note: The owner or operator shall provide sufficient documentation to prove the portable engine's residency to the satisfaction of the Executive Officer. Examples of adequate documentation are valid permits issued by a district, tax records, and usage or maintenance records. ~~With the exception of section 2456 (e)(8) of this regulation, an equivalent or identical replacement engine replacing a registered resident engine shall be treated as a resident engine.~~]

(hh) **Responsible Official** is the individual employed by a company, public agency municipality, or his contracted designee that has the authority to certify that the portable equipment complies with all applicable requirements of this article.

(~~hh~~ii) **State Territorial Waters (STW)** includes all of the following: an expanse of water that extends from the California coastline to 3 miles off-shore; a 3 mile wide belt around islands; and estuaries, rivers, and other inland waterways.

(~~ii~~jj) **Stationary Source** means any building, structure, facility or installation which emits any affected pollutant directly or as a fugitive emission. "Building," "structure," "facility," or "installation" includes all pollutant emitting activities which:

(1) are under the same ownership or operation, or which are owned or operated by entities which are under common control;
(2) belong to the same industrial grouping either by virtue of falling within the same two-digit standard industrial classification code or by virtue of being part of a common industrial process, manufacturing process, or connected process involving a common raw material; and
(3) are located on one or more contiguous or adjacent properties.

[Note: For the purposes of this regulation a stationary source and nonroad engine are mutually exclusive.]

(~~jj~~kk) **Stick Test** means the process whereby a ruler or similar device is inserted perpendicular to the bottom of the fuel tank. From the wetted length of the ruler, the amount of fuel remaining in a tank of known dimensions can be calculated.

(~~kk~~ll) **Storage** means a warehouse, enclosed yard, or other area established for the primary purpose of maintaining portable engines or equipment units when not in operation.

(~~ll~~mm) **Tactical Support Equipment (TSE)** means equipment using a portable engine, including turbines, that meets military specifications, owned by the U.S. Department of Defense ~~and/or~~, the U.S. military services, or its allies, and used in combat, combat support, combat service support, tactical or relief operations, or training for such operations. Examples include, but are not limited to, internal combustion engines associated with portable generators, aircraft start carts, heaters and lighting carts.

(~~mm~~nn)**Transportable** means the same as portable.

(~~nn~~oo) **Volatile Organic Compound (VOC)** means any compound containing at least one atom of carbon except for the following exempt compounds: acetone, ethane, parachlorobenzotrifluoride (1-chloro-4-trifluoromethyl benzene), methane, carbon

monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, ammonium carbonates, methylene chloride (dichloromethane), methyl chloroform (1,1,1-trichloroethane), CFC-113 (trichlorotrifluoroethane), CFC-11 (trichlorofluoromethane), CFC-12 (dichlorodifluoromethane), CFC-22 (chlorodifluoromethane), CFC-23 (trifluoromethane), CFC-114 (dichlorotetrafluoroethane), CFC-115 (chloropentafluoroethane), HCFC-123 (dichlorotrifluoroethane), HFC-134a (tetrafluoroethane), HCFC-141b (dichlorofluoroethane), HCFC-142b (chlorodifluoroethane), HCFC-124 (chlorotetrafluoroethane), HFC-23 (trifluoromethane), HFC-134 (tetrafluoroethane), HFC-125 (pentafluoroethane), HFC-143a (trifluoroethane), HFC-152a (difluoroethane), cyclic, branched, or linear completely methylated siloxanes, the following classes of perfluorocarbons:

(1) cyclic, branched, or linear, completely fluorinated alkanes;
(2) cyclic, branched, or linear, completely fluorinated ethers with no unsaturations;
(3) cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations; and
(4) sulfur-containing perfluorocarbons with no unsaturations and with the sulfur bonds to carbon and fluorine, acetone, ethane, and parachlorobenzotrifluoride (1-chloro-4-trifluoromethyl benzene).

(~~oo~~pp) **U.S. EPA** means the United States Environmental Protection Agency.

NOTE: Authority cited: Sections 39600-, 39601, 41752-, 41753, 41754, 41755, 43013(b) and 43018, Health and Safety Code. Reference: Sections 41750-, 41751, 41752, 41753, 41754-, 41755, Health and Safety Code.

§ 2453. Application Process.

(a) In order for an engine or equipment unit to be considered for registration by the Executive Officer, the engine or equipment unit must be portable as defined in section 2452 (x) and meet all applicable requirements established in this article.

(b) For purposes of registration under this article, a portable engine and the equipment unit it serves are considered to be separate emissions units and require separate applications.

(c) For an identical replacement, an owner or operator of a registered portable engine or equipment unit is not required to complete a new application and may immediately operate the identical replacement. Except for TSE, the owner or operator shall notify the Executive Officer in writing within five calendar days of replacing the registered portable engine or equipment unit with an identical replacement. Notification shall include company name, contact, phone number, registration certificate number of the portable engine or equipment unit to be replaced; and make, model, rated brake horsepower, serial number of the identical replacement, description of the mechanical breakdown; and applicable fees as required in section 2461. Misrepresentation of portable engine or equipment unit information and failure to meet the requirements of this regulation shall subject the owner or operator to section 2465.

~~(d) For an equivalent replacement, except for TSE, the owner or operator of a registered portable engine or equipment unit shall file a new application for registration with the Executive Officer prior to operating the equivalent replacement. The application shall include surrender of the registration identification label for the portable engine or equipment unit being replaced and appropriate fees as required in section 2461. Failure to meet the requirements of this article prior to operating the equivalent replacement may subject the owner or operator to section 2465 of this article.~~

(~~e~~d) The Executive Officer shall inform the applicant, in writing, if the application is complete or deficient, within 30 days of receipt of an application. If deemed deficient, the Executive Officer shall identify the specific information required to make the application complete.~~, according to the following schedule:~~

~~(1) within 45 days of receipt of an application, for applications received on or before June 1, 2000; and~~
~~(2) within 30 days of receipt of an application, for applications received after June 1, 2000.~~

(~~f~~e) The Executive Officer shall issue or deny registration ~~according to the following schedule:~~

~~(1) within 180 days of receipt of an application, for applications received on or before June 1, 2000; and~~
~~(2)~~ within 90 days of receipt of a~~n~~ complete application~~, for applications received after June 1, 2000~~.

(~~g~~f) Upon finding that a portable engine or equipment unit meets the requirements of this article, the Executive Officer shall issue a registration for the portable engine or equipment unit. The Executive Officer shall notify the applicant in writing that the portable engine or equipment unit has been registered. The notification shall include a registration certificate~~(s)~~, any conditions to ensure compliance with state and federal requirements, and a registration identification device for each registered portable engine or equipment unit. Except for TSE, the registration identification ~~label~~device shall be affixed on the registered portable engine or equipment unit at all times, and the registration certificate shall be kept on the immediate premises with the portable engine or equipment at all times and made accessible to the Executive Officer or districts upon request. Failure to properly maintain the registration identification device shall be deemed a violation of this article.

(~~h~~g) Except for TSE, each application for registration and the appropriate fee(s) as specified in section 2461, shall be submitted in a format approved by the Executive Officer and include, at a minimum, the following information:

(1) indication of portable engine or equipment unit status (e.g., resident~~, non-resident, non-operational, rental business, etc~~) and general nature of business (e.g. rental business, etc.);
(2) indication of "home" district, the district in which the portable engine or equipment unit operates most of the time (optional);
(3) the name of applicant, and a contact person including mailing address and telephone number;
(4) a brief description of typical portable-engine or equipment-unit use;
(5) detailed description, including portable-engine or equipment-unit make, model, manufacture year (for portable engines only), rated brake

horsepower, throughput, capacity, emission control equipment, and serial number;

(6) necessary engineering data, emissions test data, or manufacturer's emissions data to demonstrate compliance with the requirements as specified in sections 2455~~-~~, 2456, 2457;

(7) for resident engines, a copy of a current permit to operate or a registration certificate that was granted by a district ~~prior to July 1, 2001,~~ or other proof of California residency as described in section 2452 (gg); and

(8) the signature of the responsible official ~~person authorized to act on behalf of the applicant~~ and date of the signature.

(~~i~~h) For TSE, application for registration and the appropriate fee(s) as specified in section 2461, shall be submitted in a format approved by the Executive Officer and include, at a minimum, the following information:

(1) the name of applicant, and a contact person including mailing address and telephone number;

(2) a brief description of typical portable-engine or equipment-unit use;

(3) portable-engine or equipment-unit description, including type and rated brake horsepower; and

(4) the signature of the responsible official ~~person authorized to act on behalf of the applicant~~ and date of the signature.

(~~j~~i) Portable engines or equipment units owned and operated for the primary purpose of rental by a rental business shall be identified as rental at the time of application for registration and shall be issued a registration specific to the rental business requirements of this article. Portable engines or equipment units used primarily for purposes other than rental or not owned by a rental business shall not qualify for registration as a rental business. Misrepresentation of portable engine or equipment unit use in an attempt to qualify under the rental business definition shall subject the owner or operator to section 2465 of this article.

(~~k~~j) ~~An owner or operator registering a portable engine or equipment unit as non-operational may choose to have the equipment evaluated for registration eligibility at the time the initial application is filed or at the time the portable engine or equipment unit is changing to operational status. Where an initial evaluation is performed, switching from non-operational status to operational status requires notification in writing to the Executive Officer of the change in operational status and payment of all applicable fees prior to operation. Where no initial evaluation is performed, switching from non-operational status to operational status requires a complete application to be filed and approved by the Executive~~

~~Officer and payment of all applicable fees prior to operation~~ Within six months from the effective date of the regulation revisions, applications must be filed with the Executive Officer to change all registered non-operational engines and equipment units to operational status, or the registrations will be cancelled.

(k) After the effective date of the regulation revisions, new applications for non-operational engines or equipment units will not be accepted by the Executive Officer.

(l) Once registration is issued by the Executive Officer, ~~any current~~ district permits or registrations for registered portable engines or equipment units are preempted by the statewide registration and are, therefore, considered null and void, except for the following circumstances where a district permit may be required:

(1) ~~for current district permits or registrations issued for~~ portable engines or equipment units used in a project(s) operating in the OCS. The requirements of the district permit or registration apply to the registered portable engine or equipment unit while operating at the project(s) in the OCS; or

(2) ~~for current district permits or registrations issued for~~ portable engines or equipment units used in a project(s) operating in both the OCS and STW. The requirements of the district permit or registration apply to the registered portable engine or equipment unit while operating at the project(s) in the OCS and STW; or

(3) at STW project(s) that trigger district emission offset thresholds; or

(4) at any specific location where statewide registration is not valid. The portable engine or equipment unit may obtain a district permit or registration for the location(s) where the statewide registration is not valid~~.~~; or

(5) any engine or equipment unit that has been determined to cause a public nuisance as defined in Health and Safety Code Section 41700.

The portable engine or equipment unit may not be operated under both statewide registration and a district permit at any specific location.

(m) When a registered engine or equipment unit has been purchased, the new owner shall submit a change of ownership application. The existing registration is not valid for the new owner until the application has been filed and all applicable fees have been paid. Registration will be reissued to the new owner after a complete application has been approved by the Executive Officer.

NOTE: Authority cited: Sections 39600-, 39601, 41752-, 41753, 41754, 41755, 43013(b) and 43018, Health and Safety Code. Reference: Sections 41750-, 41751, 41752, 41753, 41754, 41755, Health and Safety Code.

§ 2454. Registration Process.

(a) The Executive Officer shall make registration data available to the districts (e.g., on the Internet).

(b) The Executive Officer may conduct an inspection of a portable engine or equipment unit and/or require a source test in order to verify compliance with the requirements of this article prior to issuance of registration.

(c) After obtaining registration in accordance with this article, the owner or operator of the registered portable engines or equipment units may operate within the boundaries of the State of California so long as such portable engines or equipment units comply with all applicable requirements of this article and any other applicable federal or state law.

(d) Districts shall provide the Executive Officer with written reports or electronic submittals via the Internet, describing any inspections and the nature and outcome of any violation of local, state or federal laws by the owner or operator of registered portable engines or equipment units. The Executive Officer will provide all districts with such information (e.g., on the Internet).

NOTE: Authority cited: Sections 39600-, 39601, 41752-, 41753, 41754, 41755, 43013(b) and 43018, Health and Safety Code. Reference: Sections 41750-, 41751, 41752, 41753, 41754, 41755, Health and Safety Code.

§ 2455. General Requirements.

(a) The emissions from portable engines or equipment units registered under this article shall not, in the aggregate, interfere with the attainment or maintenance of California or federal ambient air quality standards. The emissions from any one portable engine or equipment unit, exclusive of background concentration, shall not cause an exceedance of any ambient air quality standard. This paragraph shall not be construed as requiring portable engine or equipment unit operators to provide emission offsets for a portable engine or equipment unit registered under this article.

(b) Portable engines or equipment units registered under this article shall comply with article 1, chapter 3, part 4, division 26 of the California Health and Safety Code, commencing with section 41700.

(c) Except for portable engines or equipment units permitted or registered by a district in which an emergency occurs, a portable engine or equipment unit operated during an emergency as defined in section 2452 (f) of this article, is considered registered under the requirements of this article for the duration of the emergency and is exempt from sections 2455, ~~through~~ 2456, 2457, 2458, and 2459 of this article for the duration of the emergency provided the owner or operator notifies the Executive Officer within 24 hours of commencing operation. The Executive Officer may for good cause refute that an emergency under this provision exists. If the Executive Officer deems that an emergency does not exist, all operation of portable engines and equipment units covered by this provision shall cease operation immediately upon notification by the Executive Officer. Misrepresentation of an emergency and failure to cease operation under notice of the Executive Officer is a violation of this article and may subject the owner or operator to section 2465 of this article.

(d) For the purposes of registration under this article, the owner or operator of a registered portable equipment unit must notify the U.S. EPA and comply with 40 CFR 52.21 if:

(1) the portable equipment unit operates at a facility defined as a major source under 40 CFR 51.166 or 52.21, and

(A) the facility is located within 10 kilometers of a Class I area; or

(B) the portable equipment unit, operating in conjunction with other registered portable equipment units, operates at the stationary source and its operation would be defined as a major modification to the stationary source under 40 CFR 51.166 or 52.21; or

(2) the portable equipment unit, operating in conjunction with other registered portable equipment units, would be defined as a major stationary source, as defined under 40 CFR 51.166 or 52.21.

NOTE: Authority cited: Sections 39600-, 39601, 41752-, 41753, 41754, 41755, 43013(b) and 43018, Health and Safety Code. Reference: Sections 41750-, 41751, 41752, 41753, 41754, 41755, Health and Safety Code.

§ 2456. Engine Requirements

(a) For TSE, no air contaminant shall be discharged into the atmosphere, other than uncombined water vapor, for a period or periods aggregating more than three minutes in any one hour which is as dark or darker in shade as that designated as No. 2 on the Ringelmann Chart, as published by the United States Bureau of Mines, or of such opacity as to obscure an observer's view to a degree equal to or

greater than does smoke designated as No. 2 on the Ringelmann Chart. No other requirements of this section are applicable to TSE.

~~(b) A new nonroad engine rated less than 175 brake horsepower used in construction equipment as defined in 40 CFR Part 85, Subpart Q, section 85.1601 et seq. shall use only fuels meeting the standards for California motor vehicle fuels as set forth in chapter 5, division 3, Title 13 of the California Code of Regulations, commencing with section 2250; comply with the applicable daily and annual emission limits contained in section 2456 (j) of this article; and is exempt from further requirements of this section.~~

(~~e~~b) Diesel pile-driving hammers shall comply with the applicable provisions of section 41701.5 of the California Health and Safety Code and are otherwise exempt from further requirements of this section.

(~~d~~c) To be registered in the Statewide Registration Program, a registered portable engine rated less than 50 brake horsepower shall comply with the most stringent requirements, if any, for its horsepower rating and year of manufacture set forth in 40 CFR Part 89 or Title 13, California Code of Regulations. If no emission standards exist for that brake horsepower and year of manufacture at the time of registration, the engine shall comply with the applicable daily and annual emission limits contained in section 2456 (~~j~~g) of this article. No other requirements of this section are applicable to portable engines rated less than 50 brake horsepower.

(~~e~~d) Portable engines registered under this article shall:

(1) comply with the applicable daily and annual emission limits contained in section 2456 (~~j~~g) of this article;
(2) use only fuels meeting the standards for California motor vehicle fuels as set forth in chapter 5, division 3, Title 13 of the California Code of Regulations, commencing with section 2250, or other fuels and/or additives that have been verified through the Verification Procedure for In-Use Strategies to Control Emissions from Diesel Engines;
(3) not exceed particulate matter emissions concentration of 0.1 grain per standard dry cubic feet corrected to 12 percent CO_2;
(4) not discharge air contaminants into the atmosphere for a period or periods aggregating more than three minutes in any one hour which is as dark as or darker than Ringelmann 1 or equivalent 20 percent opacity;
~~(5) for an engine manufactured before January 1, 1996, meet the applicable requirements of Table 1 for compression ignition engines or Table 2 for spark ignition engines;~~
~~(6) for an engine manufactured on or after January 1, 1996, meet the most stringent emissions standard;~~

~~(7) except for an engine that qualifies as a resident engine, regardless of engine manufacture date, if registering on or after July 1, 2000, meet the most stringent emissions standards for the applicable brake horsepower range specified for California- or federally-certified newly-manufactured engines; if no emissions standards exist, then the applicable requirements contained in Table 1 or Table 2 must be met;~~

(~~8~~5) except for an engine that qualifies as a resident engine and applications for change of ownership, applications filed on or before December 31, 2005, meet the most stringent emissions standard. ~~on or a~~After ~~July 1, 2001~~ December 31, 2005, except for change of ownership, applications filed for new registration or identical ~~or equivalent~~ replacement of a registered portable engine, meet the most stringent emissions standard;

(~~9~~6) after January 1, 2010, if rated 50 brake horsepower or above and not previously meeting a federal or California standard pursuant to 40 CFR Part 86, 40 CFR Part 89 or Title 13 of the California Code of Regulations, meet the most stringent emissions standard (~~resident~~ the registration for portable engines that previously did not meet the most stringent standards listed above shall expire on December 31, 2009, and the responsible official must reapply at this time and demonstrate compliance with the most stringent emissions standard)~~; and~~. The requirements of this sub-section do not apply if the requirements of Title 13 CCR 93105.4 are satisfied;

(~~9~~7) after the effective date of this regulation revision, meet all applicable requirements in Title 13 CCR 93105; and

(~~10~~8) for the purpose of sub-sections (~~e~~d), (h), and (j), the most stringent emissions standard shall be the applicable emissions standard in effect at the time an application is deemed complete and set forth in Title 13 of the California Code of Regulations for that engine rating. If no emissions standard exists under the California Code of Regulations, then the applicable emissions standard set forth in 40 CFR Part 86 or 40 CFR Part 89 shall apply. If no standard exists under ~~the California Code of Regulations~~ 40 CFR Part 86, or 40 CFR Part 89, then the applicable requirements of 40 CFR part 1048 or Table 1 ~~for compression ignition engines or Table 2~~ for spark-ignition engines shall apply. Any engine meeting the most stringent emission standard, as defined above, is not subject to requirements (3) ~~and (4)~~ of sub-section (~~e~~d).

~~(f) Subject to Executive Officer approval, the owner or operator of a registered portable engine may obtain a temporary exemption, not to exceed 18 months in duration, except as provided in section 2456 (g), from daily and annual emission limits, and recordkeeping and reporting requirements, by submitting a compliance plan (in a format to be specified by prior agreement with the Executive Officer) to replace the existing portable engine with a newly-manufactured engine or to modify the existing portable engine to satisfy the requirements that have been set for new engines under 40 CFR Part 89 or Title 13 of the California Code of~~

~~Regulations or for spark-ignition engines that satisfy the more stringent of either an applicable emissions standard in effect at the time of application or the applicable emissions standard set forth in Table 2 of this regulation for nonresident engines. For the purposes of this section, a compliance plan shall include at a minimum:~~

~~(1) registration number of portable engine being replaced or modified;~~
~~(2) a schedule of increments of progress, which will be taken to replace or modify the registered portable engine;~~
~~(3) the proposed date of replacement or completion of modifications;~~
~~(4) the name of applicant, and a contact person including mailing address and telephone number;~~
~~(5) a brief description of typical portable engine use;~~
~~(6) newly-manufactured portable engine description, including portable engine make, model, manufacture year, rated brake horsepower, emission control engine, and serial number;~~
~~(7) detailed description of proposed modifications, including make and model of any add-on equipment;~~
~~(8) all necessary engine engineering data, emissions test data, or manufacturer's emissions data to demonstrate compliance with the requirements as specified in section 2456; and~~
~~(9) the signature of person authorized to act on behalf of the applicant and date of the signature.~~

~~[Note: An owner or operator may revise a compliance plan by submitting a modified plan to the Executive Officer at least 30 calendar days prior to the date of replacing or modifying the portable engine. The modified compliance plan shall not extend the temporary exemption from daily and annual emission limits for the registered portable engine beyond the applicable time frame allowed. Misrepresentation of portable engine information in the compliance plan or failure to comply with an approved compliance plan may result in the registration being revoked and the owner or operator being subject to penalties.]~~

~~(g) At the discretion of the Executive Officer, the temporary exemption of section 2456 (f) may be increased to 24 months for applications to replace or modify 50 or more engines and 36 months for applications to replace or modify 100 or more engines. In order to keep the 24 month or 36 month temporary exemption, the owner or operator must demonstrate measurable progress toward replacement or modification. Measurable progress shall be defined as 40 percent of the total number of engines replaced or modified each year reaching full replacement or modification by the end of the exemption period. As proof of measurable progress, the owner or operator shall provide the Executive Officer an annual report, within 60 days after the end of each calendar year, to include the reporting~~

~~year, the number of engines replaced along with their registration numbers, and the number of engines modified along with their registration numbers.~~

(~~h~~e) A registered portable engine owned and operated by a rental business and designated for use as a rental engine shall have operational and properly maintained non-resettable ~~time~~hour meters or fuel flow meters for purposes of complying with the requirements of section 2458.

(f) Any registered portable engine that is subject to an hours of operation limitation shall be equipped with a non-resettable hour meter.

~~(i) Subject to Executive Officer approval, 4-degree injection timing retard is not required for compression-ignition engines if it can be demonstrated that such modification is technologically infeasible, may cause potential engine damage, or cause an exceedance of a pollutant standard (e.g., opacity limit). The Executive Officer shall consider appropriate documentation, including, but not limited to: cost-effectiveness studies or engineering analyses. The Executive Officer may grant exemptions or require reduced injection timing (e.g., 3-, 2- or 1-degree) as determined appropriate on a case-by-case basis, for specific identical engines of the same make, model, model-year, and configuration.~~

(~~j~~g) Registered portable engines shall not exceed the following emission limits:

(1) 550 pounds per day per engine of carbon monoxide (CO);
(2) 150 pounds per day per engine of particulate matter less than 10 microns (PM_{10});
(3) for registered portable engines operating onshore, 10 tons for each pollutant per district per year per engine for NOx, SOx, VOC, PM_{10}, and CO in nonattainment areas;
(4) for registered portable engines operating within STW:

(A) the offset requirements of the corresponding onshore district apply. Authorization from the corresponding onshore district is required prior to operating within STW. If authorization is in the form of a current district permit, the terms and conditions of the district permit supercede the requirements for the project, except that the most stringent of the technology and emission concentration limits required by the district permit or statewide registration are applicable. If the portable engine does not have a current district permit, the terms and conditions of the statewide registration apply, and the corresponding onshore district may require offsets pursuant to district rules and regulations. The requirement for district offsets shall not apply to the owner/operator of a state registered engine(s) when the engine(s) is operated at a stationary source permitted by the district; and

(B) the corresponding onshore district may perform an ambient air quality impact analysis (AQIA) for the proposed project prior to granting authorization. The owner/operator of state registered engine(s) shall be required, at the request of the district, to submit any information deemed by the district to be necessary for performing the AQIA. Statewide registration shall not be valid at any location where the AQIA demonstrates a potential violation of an ambient air quality standard.

(5) for ~~resident~~ engines operating in the South Coast Air Quality Management District (SCAQMD), 100 pounds nitrogen oxides (NOx) per project per day [An owner may substitute SCAQMD permit or registration limits in effect on or before September 17, 1997 (optional)];

(6) ~~for nonresident engines,~~ 100 pounds NOx per engine per day, except in SCAQMD where the limit is 100 pounds NOx per project per day; and

(7) in lieu of (5) and (6) above, operation of a new nonroad engine rated at 750 brake horsepower or greater for which a federal or California standard pursuant to 40 CFR Part 89 or Title 13 of the California Code of Regulations has not yet become effective, shall not exceed 12 hours per day.

(8) for engines that operate in both STW and onshore, the 10 tons per district per year per engine limit in (3) above shall only apply onshore.

(9) A portable engine meeting an applicable emissions standard, as set forth in Title 13 of the California Code of Regulations, 40 CFR Part 86, 40 CFR Part 89, or for spark-ignition engines that meet ~~the more stringent of~~ either the standards set forth in 40 CFR part 1048 ~~an applicable emissions standard in effect at the time of application~~ or the applicable emissions standard set forth in Table ~~2~~1 of this regulation ~~for nonresident engines~~, is exempt from the daily and annual emission limits specified above.

(~~k~~h) Portable engines operated on a dredge shall ~~be subject to the emission controls and limits as follows:~~

~~(1) for resident dredge engines, meet section 2456 (de) requirements;~~

~~(2) for non-resident dredge engines, meet the most stringent emissions standards for the applicable brake horsepower range specified for California- or federally-certified newly-manufactured engines pursuant to 40 CFR Part 89 or Title 13 of the California Code of Regulations; and~~

~~(3) for all engines operated on a dredge,~~ meet the most stringent emission standard ~~pursuant to 40 CFR Part 89 or Title 13 of the California Code of Regulations~~ by January 1, 2005.

(~~l~~i) Registered TSE is exempt from district New Source Review and Title V programs, including any offset requirements. Further, emissions from registered

TSE shall not be included in Title V or New Source Review applicability determinations.

NOTE: Authority cited: Sections 39600-, 39601, 41752-, 41753, 41754, 41755, 43013(b) and 43018, Health and Safety Code. Reference: Sections 41750-, 41751, 41752, 41753, 41754, 41755, Health and Safety Code.

~~Table 1 - Compression-ignition Engine Requirements*~~

~~Rated Brake Horsepower~~	~~Resident Engine~~	~~Non-resident Engine~~
~~50-116~~	~~810 ppmdv NOx (10.5 g/bhp-hr)** or turbocharger or 4-degree injection timing retard***~~	~~770 ppmdv NOx (10.0 g/bhp-hr)** or turbocharger and 4-degree injection timing retard***~~
~~117-399~~	~~770 ppmdv NOx (10.0 g/bhp-hr)** or turbocharger and aftercooler/intercooler or 4-degree injection timing retard***~~	~~550 ppmdv NOx (7.2 g/bhp-hr)** or turbocharger and aftercooler/intercooler and 4-degree injection timing retard***~~
~~400-749~~	~~550 ppmdv NOx (7.2 g/bhp-hr)** or turbocharger and aftercooler/intercooler or 4-degree injection timing retard***~~	~~535 ppmdv NOx (7.0 g/bhp-hr)** or turbocharger and aftercooler/intercooler and 4-degree injection timing retard***~~
~~750+~~	~~550 ppmdv NOx (7.2 g/bhp-hr)** or turbocharger and aftercooler/intercooler or 4-degree injection timing retard***~~	~~535 ppmdv NOx (7.0 g/bhp-hr)** or turbocharger and aftercooler/intercooler and 4-degree injection timing retard***~~

~~* These requirements are in addition to requirements of sections 2455 and 2456.~~

~~** For the purpose of compliance with this article, ppmdv is parts per million NOx as NO_2 @ 15 percent oxygen averaged over 15 consecutive minutes. Limits of ppmdv are the approximate equivalent to the stated grams per brake horsepower hour limit based on assuming the engine is 35 percent efficient.~~

~~*** Requirements for 4-degree injection timing retard is not required where it can be demonstrated technologically infeasible to the satisfaction of the Executive Officer. (Refer to paragraph if)~~

Table ~~2~~1 Spark-ignition Engine Requirements*

~~Engine Status~~	Pollutant Emission Limits or Control Technology		
	NOx**	VOC**	CO**
~~Resident~~	~~213 ppmdv NOx (4.0 g/bhp-hr)~~ ~~or three-way catalyst***~~ ~~or 15 lbs/day (except in the SCAQMD)~~	~~800 ppmdv VOC (5.0 g/bhp-hr)~~ ~~or three-way catalyst***~~ ~~or 25 lbs/day (except in the SCAQMD)~~	~~17,600 ppmdv CO (200 g/bhp-hr)~~~~*~~ ~~or three-way catalyst***~~ ~~or 550 lbs/day (except in the SCAQMD)~~
~~Non-Resident~~	80 ppmdv NOx (1.5 g/bhp-hr)	240 ppmdv VOC (1.5 g/bhp-hr)	176 ppmdv CO (2.0 g/bhp-hr)

* These requirements are in addition to requirements of section 2455 and 2456.

** For the purpose of compliance with this article, ppmdv is parts per million @ 15 percent oxygen averaged over 15 consecutive minutes. Limits of ppmdv are the approximate equivalent to the stated grams per brake horsepower hour limit based on assuming the engine is 24.2 percent efficient.

~~*** The three-way catalyst must provide a minimum of 80 percent control of NOx and CO, and a minimum of 50 percent control of VOC.~~

~~* At the request of the Executive Officer, CO modeling may be required to demonstrate compliance with ambient air quality standards.~~

§ 2457. Requirements for Portable Equipment Units

(a) Emissions from a registered portable equipment unit, exclusive of emissions emitted directly from the associated portable engine, shall not exceed:

(1) 10 tons per year per district of ~~any single criteria pollutant~~PM_{10}; and
(2) 82 pounds per project per day of PM_{10}.
(3) For registered equipment units that operate within STW and onshore, emissions released while operating both in STW and onshore shall be included toward the 10 tons per year limit.

(b) Portable equipment units shall also meet the following applicable requirements:

(1) Confined abrasive blasting operations:

(A) no air contaminant shall be discharged into the atmosphere for a period or periods aggregating more than three minutes in any one hour which is as dark as or darker than Ringelmann 1 or equivalent 20 percent opacity;
(B) the particulate matter emissions shall be controlled using a fabric or cartridge filter dust collector;
(C) as a part of application for registration, the applicant shall provide manufacturer's specifications or engineering data to demonstrate a minimum particulate matter control of 99 percent for the dust collection equipment;
(D) except for vent filters, each fabric dust collector shall be equipped with an operational pressure differential gauge to measure the pressure drop across the filters; and
(E) there shall be no visible emissions beyond the property line on which the equipment is being operated.

(2) Concrete batch plants:

(A) all dry material transfer points shall be ducted through a fabric or cartridge type filter dust collector, unless there are no visible emissions from the transfer point;
(B) all cement storage silos shall be equipped with fabric or cartridge type vent filters;
(C) the silo vent filters shall be maintained in proper operating condition;
(D) no air contaminant shall be discharged into the atmosphere for a period or periods aggregating more than three minutes in any one hour which is as dark as or darker than Ringelmann 1 or equivalent 20 percent opacity;

(E) open areas and all roads subject to vehicular traffic shall be paved, watered, or chemical palliatives applied to prevent fugitive emissions in excess of 20 percent opacity or Ringelmann 1;

(F) silo service hatches shall be dust-tight;

(G) as a part of application for registration, the applicant shall provide manufacturer's specifications or engineering data to demonstrate a minimum particulate matter control of 99 percent for the fabric dust collection equipment;

(H) except for vent filters, each fabric dust collector shall be equipped with an operational pressure differential gauge to measure the pressure drop across the filters;

(I) all aggregate transfer points shall be equipped with a wet suppression system to control fugitive particulate emissions unless there are no visible emissions;

(J) all conveyors shall be covered, unless the material being transferred results in no visible emissions;

(K) wet suppression shall be used on all stockpiled material to control fugitive particulate emissions, unless the stockpiled material results in no visible emissions; and

(L) there shall be no visible emissions beyond the property line on which the equipment is being operated.

(3) Sand and gravel screening, rock crushing, and pavement crushing and recycling operations:

(A) no air contaminant shall be discharged into the atmosphere for a period or periods aggregating more than three minutes in any one hour which is as dark as or darker than Ringelmann 1 or equivalent 20 percent opacity;

(B) there shall be no visible emissions beyond the property line on which the equipment is being operated;

(C) all transfer points shall be ducted through a fabric or cartridge type filter dust collector, or shall be equipped with a wet suppression system maintaining a minimum moisture content ~~to ensure~~ unless there are no visible emissions;

(D) particulate matter emissions from each crusher shall be ducted through a fabric dust collector, or shall be equipped with a wet suppression system which maintains a minimum moisture content to ensure there are no visible emissions;

(E) all conveyors shall be covered, unless the material being transferred results in no visible emissions;

(F) all stockpiled material shall be maintained at a minimum moisture content ~~to ensure~~unless the stockpiled material results in no visible emissions;

(G) as a part of application for registration, the applicant shall provide manufacturer's specifications or engineering data to demonstrate a minimum particulate matter control of 99 percent for the fabric dust collection equipment;

(H) except for vent filters, each fabric dust collector shall be equipped with an operational pressure differential gauge to measure the pressure drop across the filters;

(I) open areas and all roads subject to vehicular traffic shall be paved, watered, or chemical palliatives applied to prevent fugitive emissions in excess of 20 percent opacity or Ringelmann 1; and

(J) if applicable, the operation shall comply with the requirements of 40 CFR Part 60 Subpart OOO.

(4) Unconfined abrasive blasting operations:

(A) no air contaminant shall be discharged into the atmosphere for a period or periods aggregating more than three minutes in any one hour which is as dark as or darker than Ringelmann 2 or equivalent 40 percent opacity;

(B) only California Air Resources Board-certified abrasive blasting material shall be used [Note: see Title 17, California Code of Regulations, section 92530 for certified abrasives.];

(C) the abrasive material shall not be reused;

(D) no air contaminant shall be released into the atmosphere which causes a public nuisance;

(E) all applicable requirements of Title 17 of California Code of Regulations shall also apply; and

(F) there shall be no visible emissions beyond the property line on which the equipment is being operated.

(5) Tub grinders and trommel screens:

(A) there shall be no visible emissions beyond the property line on which the equipment is being operated;

(B) no air contaminant shall be discharged into the atmosphere for a period or periods aggregating more than three minutes in any one hour which is as dark or darker than Ringelmann 1 or equivalent 20 percent opacity;

(C) water suppression or chemical palliatives shall be used to control fugitive particulate emissions from the tub grinder whenever the tub grinder is in operation, unless there are no visible emissions.

(c) Portable equipment units not described in section 2457(b) above, shall be subject to the most stringent district Best Available Control Technology (BACT)

requirements in effect for that category of source at the time of application for registration.

(d) Registration is not valid for any equipment unit operating at a location if by virtue of the activity to be performed hazardous air pollutants will be emitted (e.g., rock crushing plant operating in a serpentine quarry. [Note: The equipment unit would be subject to the requirements of the district in which the equipment is located.]

NOTE: Authority cited: Sections 39600~~-~~, 39601, 41752~~-~~, 41753, 41754, 41755, 43013(b) and 43018, Health and Safety Code. Reference: Sections 41750~~-~~, 41751, 41752, 41753, 41754, 41755, Health and Safety Code.

§ 2458. Recordkeeping and Reporting.

(a) Any registered portable engine, except for engines operating in STW, that meets one of the following criteria is exempt from the requirements of this section, except for sub-sections (e), (f), and (g):

(1) an applicable emissions standard as set forth in Title 13 of the California Code of Regulations, 40 CFR part 86, or 40 CFR Part 89; or

~~(2) the requirements for a temporary exemption pursuant to sections 2456 (f) or (g) of this article; or~~

(~~3~~2) for spark-ignition engines, the ~~more stringent of an applicable~~ emissions standard set forth in ~~effect at the time of application~~40 CFR part 1048 or set forth in Table ~~2~~1 of section 2456~~ for nonresident engines~~.

(b) Except for~~a~~ rental ~~business~~engines and TSE, the owner of a registered portable engine subject to operational limitaions, including engines otherwise preempted under section 209 (e), or portable equipment unit shall maintain daily records for each registered portable engine and equipment unit. The daily records shall be maintained at a central place of business for ~~two~~five years, and made accessible to the Executive Officer or districts upon request. Daily records shall be maintained in a format approved by the Executive Officer and include, at a minimum, all of the following:

(1) portable engine or equipment unit registration number;
(2) month, day and year;
(3) the location(s) at which the portable engine or equipment unit was operated, identified by district, county, or specific location(s);
(4) for equipment units, the total process weight or throughput; ~~and~~
(5) for engines that are subject to hours of operation limitations, ~~either total fuel used in gallons per hour or day and an estimate of hours of operation, or~~ actual hours of operation~~.~~; and

~~(A) If recordkeeping of actual hours of operation is kept instead of fuel use records, then the engine shall be equipped with an operational and properly maintained non-resettable hour meter.~~

(6) for engines that are subject to fuel use limitations, total fuel used in gallons.

~~(B)~~ Daily fuel consumption ~~must~~shall be measured either by fuel flow meter, fuel tank stick test, or by fuel purchase records. If fuel purchase records or a stick test is used, the operator ~~must~~shall record the average operating load of the engine or use the approved operating load default factors, and the calculation approved by the Executive Officer to determine the daily fuel use for the engine. The stick test ~~must~~shall be performed prior to the start of and after the shutdown of operations on any given day to determine the amount of fuel used on that day. For an engine that operates on a 24-hour basis, the stick test ~~must~~shall be performed once at the same time each day of uninterrupted operation, and then compared to the previous day's test to calculate daily fuel use.

(c) The owner of a registered portable engine ~~or equipment unit~~ owned by a rental business and designated for the purpose of renting, shall maintain records for each transaction. The owner shall provide each person who rents the portable engine ~~or equipment unit~~ with a written copy of applicable requirements of this article, including recordkeeping and notification requirements, as a part of the agreement. The records, including written acknowledgment by each renter of the portable engine ~~or equipment unit~~ of having received the above information, shall be maintained at a central location for ~~two~~five years, and made accessible to the Executive Officer or districts upon request. Records shall be maintained in a format approved by the Executive Officer and include, at a minimum, for each registered portable engine ~~or equipment unit~~ all of the following:

(1) portable engine ~~or equipment unit~~ registration number;

(2) dates portable engine ~~or equipment unit~~ left and returned to a rental yard;

~~(3) location of operation, identified by district, county, or specific location(s); and~~

(4~~3~~) hours of operation for each rental period ~~and estimation of hours operated per day~~.

~~(d) Except for TSE, the owner of a registered portable engine or equipment unit shall provide the Executive Officer an annual report, in a format approved by the Executive Officer, within 60 days after the end of each calendar year all of the following information:~~

~~(1) reporting year;~~

~~(2) for engines, quarterly summaries for each district or county of total fuel usage in gallons per quarter and an estimate of hours of operation, or total~~

~~hours of operation per quarter, for each portable engine or equipment unit; and~~

~~(3) for equipment units, quarterly summaries for each district or county of total process weight or throughput.~~

(~~e~~d) For TSE, each military installation shall provide the Executive Officer an annual report, in a format approved by the Executive Officer, within 60 days after the end of each calendar year. The report shall ~~to~~ include the number, type, and rating of registered TSE at each installation as of December 31 of that calendar year, and be accompanied by the applicable fees pursuant to section 2461. Any variation of registered TSE to actual TSE shall be accounted for in this annual report, and the Executive Officer shall issue an updated TSE list accordingly. A renewal registration will be issued with the updated TSE list every three years according to expiration date. ~~Any increase in the number of TSE at each military installation during the calendar year shall require the military installation to submit an application for registration for the additional TSE along with any applicable fees to the Executive Officer, within 60 days after the end of each calendar year.~~

(e) For generators used to provide power to a building, facility, stationary source, or stationary equipment during unforeseen interruptions of electrical power from the serving utility, the owner or operator shall maintain a daily record that shall include the following:

(1) location; and

(2) month, day, and year of operation; and

(3) hours of operation.

(f) For each engine subject to the requirements of Title 13 California Code of Regulations section 93105, the owner shall keep records and submit reports in accordance with Title 13 California Code of Regulations section 93105.5:

NOTE: Authority cited: Sections 39600-, 39601, 41752-, 41753, 41754, 41755, 43013(b) and 43018, Health and Safety Code. Reference: Sections 41750-, 41751, 41752, 41753, 41754, 41755, Health and Safety Code.

§ 2459. Notification.

(a) Except as listed in sub-section (f) of this section, if a registered portable engine or equipment unit will be in a district for more than five days, the owner or operator or renter (except as noted in (c) below), shall notify the district in writing, via facsimile, or by telephone, within two working days of commencing operations in that district. The notification shall include all of the following:

(1) the registration number of the portable engine or equipment unit;
(2) the name and phone number of a contact person with information concerning the locations where the portable engine or equipment unit will be operated within the district; and
(3) estimated time the portable engine or equipment unit will be located in the district.

(b) If the district has not been notified as required in paragraph (a), because the owner or operator did not expect the duration of operation in the district to trigger the notification requirement, the owner or operator or renter (except as noted in (c) below), shall notify the district within 12 hours of determining the portable engine or equipment unit will be operating in the district more than five days.

(c) Except as listed in sub-section (f) of this section, owners and operators of registered portable engines rated less than 200 brake horsepower and designated by the Executive Officer for rental use by a rental business are not subject to notification requirements.

(d) Owners and operators of TSE are not subject to notification requirements.

(e) Except as listed in sub-section (f) of this section, owners and operators of registered portable engines or equipment units moving into~~from one location to another location within the boundaries of~~ the designated "home" district are not subject to notification requirements, providing the home district is identified at the time of registration.

(f) For STW projects, the owner and/or operator of such equipment ~~must~~shall notify the corresponding onshore district in writing, via facsimile, or by telephone, at least 14 days in advance of commencing operations in that district. The notification shall include all of the following:

(1) the registration number of the portable engine(s) or equipment unit(s);
(2) the name and phone number of a contact person with information concerning the locations where the portable engine(s) or equipment unit(s) will be operated within the district;

(3) estimated time the portable engine(s) or equipment unit(s) will be located in the district; and

(4) estimation of actual emissions expected for the project.

NOTE: Authority cited: Sections 39600-, 39601, 41752-, 41753, 41754, 41755, 43013(b) and 43018, Health and Safety Code. Reference: Sections 41750-, 41751, 41752, 41753, 41754, 41755, Health and Safety Code.

§ 2460. Testing.

(a) In determining if a portable engine or equipment unit is eligible for registration, the Executive Officer may inspect a portable engine or equipment unit and/or require a source test, at the owner's expense, in order to verify information submitted in the application except as provided in section 2460 (d).

(b) After issuance of registration, the Executive Officer or district may at any time conduct an inspection of any registered portable engine or equipment unit in order to verify compliance with the requirements of this article. However, source testing of engines for compliance purposes shall not be required more frequently than once every three years (including testing at the time of registration), except as provided in section 2460 (d), unless evidence of engine tampering, lack of proper engine maintenance, or other problems or operating conditions that could affect engine emissions are identified. In no event shall the Executive Officer or district require source testing of a portable engine for which there is no applicable emission standard, emission limit or other emission related requirement contained in this regulation.

(c) Testing shall be conducted in accordance with the following methods or other methods approved by the Executive Officer:

Particulate Matter:	***ARB Test Method 5 with probe catch and filter catch only***
VOC:	ARB Test Method 100 or U.S. EPA Test Method 25A
NOx:	ARB Test Method 100 or U.S. EPA Test Method 7E
Carbon Monoxide:	ARB Test Method 100 or U.S. EPA Test Method 10
Oxygen:	ARB Test Method 100 or U.S. EPA Test Method 3A
Gas Velocity and Flow Rate:	ARB Test Method 1 & 2 or U.S. EPA Test Method 1 & 2

(d) Initial or follow-up source testing of engines to verify compliance with the requirements of this regulation shall not be required for the following:

(1) engines certified to satisfy the most stringent emissions standards for the applicable horsepower range specified for State or federal newly-manufactured engines pursuant to Title 13 of the California Code of Regulations, 40 CFR Part 86, or 40 CFR Part 89; or

(2) engines certified to meet the most stringent emissions standards for the applicable horsepower range specified for State or federal on-highway engines pursuant to Title 13 of the California Code of Regulations; or

(3) engines that are retrofitted to meet the most stringent emissions standards for the applicable horsepower range specified for State or federal newly-manufactured engines pursuant to Title 13 of the California Code of Regulations or 40 CFR Part 89, where the retrofit kit has undergone testing consistent with the applicable certification procedures.

(e) The exemption provided in section 2460 (d) shall not apply to source testing of engines for compliance purposes where evidence of engine tampering, lack of proper engine maintenance, or other problems or operating conditions that could affect engine emissions are identified.

NOTE: Authority cited: Sections 39600-, 39601, 41752-, 41753, 41754, 41755, 43013(b) and 43018, Health and Safety Code. Reference: Sections 41750-, 41751, 41752, 41753, 41754, 41755, Health and Safety Code.

§ 2461. Fees.

(a) The Executive Officer shall assess and collect reasonable fees for registration, renewal, and associated administrative tasks, to recover the estimated costs to the Executive Officer for evaluating registration applications, and issuing registration documentation.

(b) Fees shall be due and payable to the Executive Officer at the time an application is filed or as part of any request requiring a fee. Fees are nonrefundable except in circumstances as determined by the Executive Officer.

(c) The owner or operator of a portable engine or equipment unit shall submit fees to the Executive Officer in accordance with Table ~~3~~2.

~~(d) An owner or operator of a registered portable engine or equipment unit may, at time of renewal, change from operational to non-operational status by notifying the Executive Officer in writing and paying the applicable fee of $45.00.~~

(e~~d~~) ~~An owner or operator of a non-operational portable engine or equipment unit evaluated for registration eligibility at the time of registration shall be assessed a fee of $60.00 at the time of application.~~ Prior to switching from non-operational

to operational status, the owner or operator shall pay ~~a~~ the applicable fee ~~of $30~~ as listed in Table 2. The Executive Officer shall verify that the portable engine or equipment unit meets the requirements of this article prior to operation of the portable engine or equipment unit.

~~(f) An owner or operator of a non-operational portable engine or equipment unit not evaluated for registration eligibility at the time of registration shall be assessed a fee of $30.00 at the time of application. Prior to switching from non-operational to operational, the owner or operator shall notify the Executive Officer by submitting an application including a fee of $60.00. The Executive Officer shall verify that the portable engine or equipment unit meets the requirements of this article prior to operation of the portable engine or equipment unit. Misrepresentation of portable engine or equipment unit information and failure to meet the requirements of this article may subject the owner or operator to revocation or suspension of registration and/or penalties under this article.~~

(~~g~~e) A district may collect an enforcement inspection fee ~~of $75.00~~ as listed in Table 2 one time per calendar year for each registered portable engine or equipment unit inspected~~,~~. When multiple registered portable engines or equipment units are inspected at a given source, the district inspection fee shall be equal to the lesser of the actual cost, including staff time, for conducting the inspection or the fee as listed in Table 2 per registered portable engine or equipment unit inspected. ~~unless for reasonable cause~~ If the district performs an inspection leading to determination of non-compliance with this article, or any applicable state or federal requirements~~. In this instance~~, the district may charge ~~$75.00~~ a fee as listed in Table 2 per portable engine or equipment unit for each inspection necessary for the determination and ultimate resolution of the violation. In no event shall the total fees exceed the actual costs, including staff time, to the district of conducting the investigations and resolving any violations.

~~(h) If the registration is valid for more than three years, the renewal fee shall be the sum of the standard renewal fee of $90.00 and a prorated fee of $30.00 per year based on the number of years the registration exceeds three years.~~

(~~i~~f) Failure to pay renewal fees when due ~~may~~shall result in penalties. If no fee payment is received ~~within 30 days of written notice~~ and postmarked by the specified due date, fee penalties ~~ranging from $15.00 to $45.00~~ shall be assessed per unit in accordance with Table 2. Failure to pay renewal fees prior to expiration ~~within 90 days of written notice may~~ shall result in cancellation of the registration. If a registration has expired for an engine or equipment unit that is eligible for reinstatement, a ~~C~~canceled registration may be reinstated ~~by reapplying for registration and~~ after payment of all renewal and penalty fees ~~within 90 days of written notice of cancellation~~. Registration shall be reissued under the original registration number and expiration date. A portable engine or

equipment unit without valid registration is subject to the rules and regulations of the district in which it operates.

~~(j) The Executive Officer may consolidate renewal fees by prorating the renewal fees of multiple registered portable engines and equipment units.~~

(~~k~~g) Fees shall be periodically revised by the Executive Officer in accordance with the consumer price index, as published by the United States Bureau of Labor Statistics.

(~~l~~h) In lieu of section 2461 (g) above, a district may collect a fee, in an amount to be assessed by the district, for costs associated with implementing and enforcing the requirements of 40 CFR Part 60 Subpart OOO for each registered equipment unit subject to Subpart OOO. In no event shall the fee assessed exceed the actual costs, including staff time, to the district for implementing and enforcing Subpart OOO. If for reasonable cause, the district performs an inspection leading to determination of non-compliance with this article, or any applicable state or federal requirements, the district may charge a fee per portable equipment unit for each inspection necessary for the determination and ultimate resolution of the violation. In no event shall the total fees exceed the actual costs, including staff time, to the district of conducting the investigations and resolving any violations.

(i) TSE fees are due at the time of the report pursuant to section 2458 (d). Failure to submit the annual report and applicable fees within six calendar months after the end of the year will result in cancellation of the registration. For TSE, if registration is cancelled or allowed to expire, the applicant shall reapply and pay initial registration fees.

NOTE: Authority cited: Sections 39600-, 39601, 41752-, 41753, 41754, 41755, 43013(b) and 43018, Health and Safety Code. Reference: Sections 41750-, 41751, 41752, 41753, 41754, 41755, Health and Safety Code.

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Table ~~3~~2 ~~Registration and Renewal~~ Fees for Statewide Registration Program
(Fees are per registered unit except where noted otherwise)

1	Initial Registration	~~$90.00~~ 270.00
2	Tactical support equipment, initial registration	
a	Registration of first 25 units (or portion thereof)	~~$1,500.00~~750.00
b	Registration of every additional 50 units (or portion thereof)	~~$1,500.00~~750.00
~~3~~	~~Non-operational portable engines or equipment units~~	
~~a~~	~~Without initial evaluation~~	~~$30.00~~
~~b~~	~~With initial evaluation~~	~~$60.00~~
43	Change of status from non-operational to operational	
a	Where initial evaluation has not been previously completed	~~$60.00~~ 180.00
b	Where initial evaluation has been previously completed	~~$30.00~~ 90.00
~~5~~4	Identical replacement	~~$15.00~~ 75.00
~~6~~	~~Equivalent replacement (treated as a new registration, fees are the same as above for new registration)~~	
~~7~~	~~Renewal~~	
~~a~~5	Renewal ~~E~~every 3 years, non-TSE ~~per registered portable engine or equipment unit~~	~~$90.00~~ 225.00
~~b~~	~~Pro-rated yearly per registered portable engine or equipment unit~~	~~$30.00~~
~~c~~	~~Non-operational 3 years (prorated @ $10/year) per registered portable engine or equipment unit~~	~~$30.00~~
~~d~~	~~Change of status from operational to non-operational plus non-operational renewal~~	~~$45.00~~
~~8~~	~~Renewal for tactical support equipment~~	
~~a~~	~~first 25 units (or portion thereof)~~	~~$750.00~~
~~b~~	~~every additional 50 units (or portion thereof)~~	~~$750.00~~
~~9~~6	Penalty fee for late renewal payments, non-TSE ~~per registered portable engine or equipment unit~~	
a	~~30-60 days after receiving renewal notice~~Postmarked within 2 calendar months prior to registration expiration date	~~$15.00~~ 45.00
b	~~60-90 days after receiving renewal notice~~Postmarked within the calendar month prior to registration expiration date	~~$30.00~~ 90.00
c	~~90 days after receiving renewal notice~~Postmarked after the registration expiration date	~~$45.00~~ 250.00
7	Annual TSE inventory fee	
a	first 25 units (or portion thereof)	$375.00
b	every additional 50 units (or portion thereof)	$375.00
~~10~~8	Modification to registered portable engine or equipment unit	~~$15.00~~ 75.00
~~11~~9	Change of ownership ~~per registered portable engine or equipment unit~~	~~$15.00~~ 75.00
~~12~~10	Replacement of registration identification device	~~$10.00~~ 30.00
11	Correction to an engine or equipment unit description	$45.00
12	Update company information, copy of registration documents	$45.00

13	Copy of registration documents	$45.00
1~~3~~4	District inspection fee per registered portable engine or equipment unit inspected	$75.00

* When multiple registered portable engines or equipment units are inspected at a given source, the district inspection fee shall be equal to the lesser of the actual cost, including staff time, for conducting the inspection or $75 per registered portable engine or equipment unit inspected.

§ 2462. Duration of registration.

~~(a) For registration applications received by September 17, 1998, the Executive Officer may issue registration valid for more than three years in order to evenly distribute future renewals.~~

(~~b~~a) Except as provided for in section 2456(d)(6), ~~for registrations issued the first year,~~ registrations and renewals will be valid for three consecutive years from date of issuance.

(~~c~~b) The Executive Officer shall mail to the owner or operator of a registered portable engine or equipment unit a renewal invoice at least 60 days prior to the registration expiration.

NOTE: Authority cited: Sections 39600~~-~~, 39601, 41752~~-~~, 41753, 41754, 41755, 43013(b) and 43018, Health and Safety Code. Reference: Sections 41750~~-~~, 41751, 41752, 41753, 41754, 41755, Health and Safety Code.

§ 2463. Suspension or revocation of registration.

(a) The Executive Officer for just cause may suspend or revoke registration in any of the following circumstances:

(1) the holder of registration has violated one or more terms and conditions of registration or has refused to comply with any of the requirements of this article;

(2) the holder of registration has materially misrepresented the meaning, findings, effect or any other material aspect of the registration application, including submitting false or incomplete information in its application for registration regardless of the holder's personal knowledge of the falsity or incompleteness of the information;

(3) the test data submitted by the holder of registration to show compliance with this regulation have been found to be inaccurate or invalid;

(4) enforcement officers of the ARB or the Districts, after presentation of proper credentials, have been denied access, during normal business hours or hours of operation, to any facility or location where registered portable engines and equipment units are operated or stored and are prevented from inspecting such engines or equipment units as provided for in this article (the duty to provide access applies whether or not the holder of registration owns or controls the facility or location in question);

(5) enforcement officers of the ARB or the Districts, after presentation of proper credentials, have been denied access to any records required by this regulation for the purpose of inspection and duplication;

(6) the registered portable engine or equipment unit has failed in-use to

comply with the findings set forth in the registration. For the purposes of this section, noncompliance with the registration may include, but is not limited to:

(A) a repeated failure to perform to the standards set forth in this article; or

(B) modification of the engine or equipment unit that results in an increase in emissions or changes the efficiency or operating conditions of such engine or equipment unit, without prior notice to and approval by the Executive Officer; or

(7) the holder of registration has failed to take requested corrective action as set forth in a Notice of Violation or Notice to Comply within the time period set forth in such notice.

(b) A registration holder may be subject to a suspension or revocation action pursuant to this section based upon the actions of an agent, employee, licensee, or other authorized representative.

(c) The Executive Officer shall notify each holder of registration by certified mail of any action taken by the Executive Officer to suspend or revoke any registration granted under this article. The notice shall set forth the reasons for and evidence supporting the action(s) taken. A suspension or revocation is effective upon receipt of the notification.

(d) A party having received a notice to revoke or suspend registration may request that the action be stayed pending a hearing under section 2464. In determining whether to grant the stay, the hearing officer shall consider the reasonable likelihood that the registration holder will prevail on the merits of the appeal and the harm the registration holder will likely suffer if the stay is not granted. The Executive Officer shall deny the stay if the adverse effects of the stay on the public health, safety, and welfare outweigh the harm to the registration holder if the stay is not granted.

(e) Once a registration has been suspended pursuant to (a) above, the holder of registration ~~must~~shall satisfy and correct all noted reasons for the suspension and submit a written report to the Executive Officer advising him or her of all such steps taken by the holder before the Executive Officer will consider reinstating the registration.

(f) After the Executive Officer suspends or revokes a registration pursuant to this section and prior to commencement of a hearing under section 2464, if the holder of registration demonstrates to the Executive Officer satisfaction that the decision to suspend or revoke the registration was based on erroneous information, the Executive Officer will reinstate the registration.

(g) Nothing in this section shall prohibit the Executive Officer from taking any other action provided for by law for violations of the Health and Safety Code.

NOTE: Authority cited: Sections 39600-, 39601, 41752-, 41753, 41754, 41755, 43013(b) and 43018, Health and Safety Code. Reference: Sections 41750-, 41751, 41752, 41753, 41754, 41755, Health and Safety Code.

§ 2464. Appeals.

(a) Hearing Procedures

(1) Any applicant for, or a holder of, registration whose application or registration has been denied, suspended, or revoked may request a hearing to review the action taken by sending a request in writing to the Executive Officer. A request for hearing shall include, at a minimum, the following:

(A) name of applicant or registration holder;
(B) registration number;
(C) copy of the Executive Order revoking or suspending registration or the written notification of denial;
(D) a concise statement of the issues to be raised, with supporting facts, setting forth the basis for challenging the denial, suspension, or revocation (mere conclusory allegations will not suffice);
(E) a brief summary of evidence in support of the statement of facts required in (D) above; and
(F) the signature of an authorized person requesting the hearing.

(2) A request for a hearing shall be filed within 20 days from the date of issuance of the notice of the denial, suspension, or revocation.

(3) A hearing requested pursuant to this section shall be heard by a qualified and impartial hearing officer appointed by the Executive Officer. The hearing officer may be an employee of the ARB, but may not be any employee who was involved with the registration at issue. In a request for hearing of a denial of registration, after reviewing the request for hearing and supporting documentation provided under subsection (1) above, the hearing officer shall grant the request for a hearing if he or she finds that the request raises a genuine and substantial question of law or fact.

(4) Except as provided in (3) above, the hearing officer shall schedule and hold, as soon as practicable, a hearing at a time and place determined by the hearing officer.

(5) Upon appointment, the hearing officer shall establish a hearing file. The file shall consist of the following:

(A) the determination issued by the Executive Officer which is the subject of the request for hearing;
(B) the request for hearing and the supporting documents that are submitted with it;
(C) all documents relating to and relied upon in making the determination to deny registration or to suspend or revoke registration; and
(D) correspondence and other documents material to the hearing.

(6) The hearing file shall be available for inspection by the applicant at the office of the hearing officer.

(7) An applicant may appear in person or may be represented by counsel or by any other duly-authorized representative.

(8) The ARB may be represented by staff or counsel familiar with the registration program and may present rebuttal evidence.

(9) Technical rules of evidence shall not apply to the hearing, except that relevant evidence may be admitted and given probative effect only if it is the kind of evidence upon which reasonable persons are accustomed to relying in the conduct of serious affairs. No action shall be overturned based solely on hearsay evidence, unless the hearsay evidence would be admissible in a court of law under a legally recognized exception to the hearsay rule.

(10) The hearing shall be recorded either electronically or by certified shorthand reporter.

(11) If a hearing is held, the hearing officer shall render a written decision within 30 working days from the last day of hearing. The hearing officer may do any of the following:

(A) uphold the denial, suspension, or revocation action as issued;
(B) reduce a revocation to a suspension;
(C) increase a suspension to a revocation if the registration holder's conduct so warrants; and
(D) overturn a denial, suspension, or revocation in its entirety.

(12) The hearing officer shall consider the totality of the circumstances of the denial, suspension, or revocation, including but not limited to credibility of witnesses, authenticity and reliability of documents, and qualifications

of experts. The hearin: ·cer may also consider relevant past conduct of the applicant includin rior incidents involving other ARB programs.

(13) The hearing officer's written decision shall set forth findings of fact and conclusions of law as necessary.

(b) Hearing conducted by written submission.

(1) In lieu of the hearing procedure set forth in (a) above, an applicant may request that the hearing be conducted solely by written submission.

(2) In such case the requestor must submit a written explanation of the basis for the appeal and provide supporting documents within 20 days of making the request. Subsequent to such a submission the following shall transpire:

(A) ARB staff shall submit a written response to the requestors submission and documents in support of the Executive Officer's action no later than 10 days after receipt of requestor's submission;

(B) The registration holder may submit one rebuttal statement which may include supporting information, as attachment(s), but limited to the issues previously raised;

(C) If the registration holder submits a rebuttal, ARB staff may submit one rebuttal statement which may include supporting information, as attachment(s), but limited to the issues previously raised; and

(D) the hearing officer shall be designated in the same manner as set forth in (a)(3) above. The hearing officer shall receive all statements and documents and render a written decision. The hearing officer's decision shall be mailed to the requestor no later than 30 working days after the final deadline for submission of papers.

NOTE: Authority cited: Sections 39600-, 39601, 41752-, 41753, 41754, 41755, 43013(b) and 43018, Health and Safety Code. Reference: Sections 41750-, 41751, 41752, 41753, 41754, 41755, Health and Safety Code.

§ 2465. Penalties.

Violation of the provisions of this article may result in a nuisance, civil, and/or criminal violations which may result in imprisonment and/or fines as specified in the article and in the referenced sections of the California Health and Safety Code.

NOTE: Authority cited: Sections 39600-, 39601, 41752-, 41753, 41754, 41755, 43013(b) and 43018, Health and Safety Code. Reference: Sections 41750-, 41751, 41752, 41753, 41754, 41755, Health and Safety Code.

~~§ 2466. Sunset Review.~~

~~Within five years from the effective date of adoption or date of implementation, which ever comes later, the Air Resources Board, in consultation with the Secretary for Environmental Protection, shall review the provisions of this article to determine whether it should be retained, revised, or repealed.~~

~~NOTE: Authority cited: Sections 39600-39601, 41752-41755, 43013(b) and 43018, Health and Safety Code. Reference: Sections 39600, 39601, and 41750, Health and Safety Code.~~

Appendix B:

INCREASED PROGRAM FEES

Appendix B

INCREASED PROGRAM FEES

California Health and Safety Code Section 41752 authorizes the ARB to implement a fee schedule such that adequate income is received to administer the Statewide Portable Equipment Registration Program (PERP program). When the original Statewide Portable Equipment Registration Program Regulation (Statewide Regulation) became law, the fees were based on an estimated cost to the State to administer the Program. It was simply assumed that the time required to process each new unit would be 1.5 hours and each renewed unit would be 0.5 hours. This approach was too simplistic given the resources needed to fully process an application and the unique problems inherent to many applications, as well as to administer and manage a program consisting of such a diverse combination of units (includes various types of engines and equipment units) and requirements. Cost analyses conducted have revealed that the program is seriously underfunded when fees received and staff resources utilized have been considered using available data since the program began. Staff is proposing that the existing fee schedule be increased in an equitable manner such that the program fees will balance current and expected future program costs. The added workload that is expected to occur due to the implementation of the Portable Engine ATCM and the proposed PERP amendments has been taken into account in the proposed fee increase. It is important to note that no previous fee increase has occurred since the Statewide Regulation became effective in 1997.

A study of fees received and expenses incurred were developed that included information from the first five and one half years of the PERP program. It was shown that the program had received fees of about $2.5 million dollars and the total expenses were about $6 million dollars. This analysis indicated that even if the workload did not increase, the fees would need to increase by nearly two and one half times for the program to be sustainable. The study was continued by determining annual average fees received during the last three years of the program (thus includes only those years when renewal money was received). The three year average annual fee amount received was about $0.5 million dollars. Future expenses were projected to be about 1.5 million dollars per year to account for expected growth in the PERP program and the proposed Portable Engine ATCM. As a result, the required annual income to match expenses needs to nearly triple. The fee schedule and the difficulty of each associated task was considered in determining the appropriate fee adjustment to achieve a sustainable program and is shown in the revised Table 2 from the Statewide Regulation and as Table 1 in this appendix.

The major proposed fee change is for new and renewed registrations. Both new and renewed registrations are currently $90 for a three-year registration. Staff is proposing a new registration fee of $270 for a three-year registration and a renewed registration fee of $225 for a three-year period. (Although the effort required to process a submittal varies greatly, this translates to an overall program time requirement of nearly 4 hours per new unit and about 3 hours per renewed unit.) Some reduction in the cost of a renewal versus a new unit is now proposed as a renewal should be somewhat less difficult to process. It should be noted, though, that the proposed Portable Engine ATCM may require additional conditions for existing units and an associated increased processing time during renewal. The total processing time for a renewal may actually then be nearly the same as that for a new unit.

An increase is also proposed for the other fees on the schedule, except for initial registration of military TSE. Although the other fee amounts are considerably smaller than the initial and renewal fees, the percent increase may be higher. In evaluating the other fees, staff believes certain fees are presently set far too low when the revenues are compared to the resources needed to complete the necessary tasks. Examples are changes of ownership, modifications, and identical replacements, for which the fee is proposed to increase from $15 to $75 per unit. These types of applications are more than just an administrative function, as a written permit analysis is prepared and often extra time is needed to verify that what is being requested is indeed appropriate.

Another example is a unit with an expired registration that has been removed from the program but later wishes to reregister. Although all renewal late fees are proposed to increase, this particular late fee is proposed to increase the most, from $45 to $250 per unit. The proposal to significantly increase this late fee is not only intended to recover the costs of reactivating expired registrations, but also to institute an incentive for participants to pay their renewal fees on time.

Military TSE currently has a fee structure based on groups of units (or fleets) and renewal costs are one-half the cost of initial registration fee. In addition, military TSE has much simpler operational requirements than other units. Because of this and the fact that most TSE has already been registered, the initial military registration cost is not proposed to be increase. However, Staff does propose the equivalent to a 50% increase in renewal fees for the military TSE to cover the administrative costs associated with annual inventory list development and the renewal of the registration. In addition, a fundamental change in TSE fee payment is being proposed as to better accommodate both the required annual TSE inventory submittal and the required three-year registration period. For example, the initial fee for a new TSE source with less than 25 units is proposed to be $750, instead of $1500. Over a three-year period, though, the newly proposed annual inventory fee of $375 would make the total amount received after three years the same ($1500). Further, we are proposing to eliminate the

renewal fee and utilize the new annual inventory fee as a surrogate. This new fee will result in a 50% increase in fees over a three-year period. As an example, the source described above would currently be required to submit $750 to renew for a three-year period. Three annual inventory fees of $375 would result in a total three-year fee payment of $1125.

Non-operational engine/equipment units are proposed to be phase out of the PERP program. Consequently, all of the fees associated with registration and renewal of these units are being deleted. Owners with non-operational units will be allowed to change their unit status to "Operational," and there will be fees charged of $90 or $180, depending on whether an initial evaluation had been performed. Finally, new fees have been added to cover minor administrative duties. These include correcting an engine or equipment unit description in the registration, updating the general company information with new documents, and supplying a copy of registration documents. The charge for each of these tasks is $45. Also, fees for replacement of a registration identification device have increased from $10 to $30 to more accurately account for the resources involved in processing this request.

Even with the proposed fee increases, PERP registration will be considerably less costly to industry than permit fees required by the districts. A study of six districts indicated that the three year operating permit fee for a 300 hp engine ranges from $330 to $2112, perhaps higher if emission associated fees are included. Moreover, if permits in multiple districts are required, the total cost would be significantly higher.

Table ~~3~~ 1 ~~Registration and Renewal~~ Fees for Statewide Registration Program
(Fees are per registered unit except where noted otherwise)

1	Initial Registration	~~$90.00~~ 270.00
2	Tactical support equipment, initial registration	
a	Registration of first 25 units (or portion thereof)	~~$1,500.00~~750.00
b	Registration of every additional 50 units (or portion thereof)	~~$1,500.00~~750.00
~~3~~	~~Non-operational portable engines or equipment units~~	
~~a~~	~~Without initial evaluation~~	~~$30.00~~
~~b~~	~~With initial evaluation~~	~~$60.00~~
~~4~~3	Change of status from non-operational to operational	
a	Where initial evaluation has not been previously completed	~~$60.00~~ 180.00
b	Where initial evaluation has been previously completed	~~$30.00~~ 90.00
~~5~~4	Identical replacement	~~$15.00~~ 75.00
~~6~~	~~Equivalent replacement (treated as a new registration, fees are the same as above for new registration)~~	
~~7~~	~~Renewal~~	
~~a~~5	Renewal ~~E~~every 3 years, non-TSE ~~per registered portable engine or equipment unit~~	~~$90.00~~ 225.00
~~b~~	~~Pro-rated yearly per registered portable engine or equipment unit~~	~~$30.00~~
~~c~~	~~Non-operational 3 years (prorated @ $10/year) per registered portable engine or equipment unit~~	~~$30.00~~
~~d~~	~~Change of status from operational to non-operational plus non-operational renewal~~	~~$45.00~~
~~8~~	~~Renewal for tactical support equipment~~	
~~a~~	~~first 25 units (or portion thereof)~~	~~$750.00~~
~~b~~	~~every additional 50 units (or portion thereof)~~	~~$750.00~~
~~9~~6	Penalty fee for late renewal payments, non-TSE ~~per registered portable engine or equipment unit~~	
a	~~30-60 days after receiving renewal notice~~Postmarked within 2 calendar months prior to registration expiration date	~~$15.00~~ 45.00
b	~~60-90 days after receiving renewal notice~~Postmarked within the calendar month prior to registration expiration date	~~$30.00~~ 90.00
c	~~90 days after receiving renewal notice~~Postmarked after the registration expiration date	~~$45.00~~ 250.00
7	Annual TSE inventory fee	
a	first 25 units (or portion thereof)	$375.00
b	every additional 50 units (or portion thereof)	$375.00
~~10~~8	Modification to registered portable engine or equipment unit	~~$15.00~~ 75.00

~~11~~9	Change of ownership ~~per registered portable engine or equipment unit~~	~~$15.00~~ 75.00
~~12~~10	Replacement of registration identification device	~~$10.00~~ 30.00
11	Correction to an engine or equipment unit description	$45.00
12	Update company information, copy of registration documents	$45.00
13	Copy of registration documents	$45.00
13~~4~~	District inspection fee per registered portable engine or equipment unit inspected	$75.00

* When multiple registered portable engines or equipment units are inspected at a given source, the district inspection fee shall be equal to the lesser of the actual cost, including staff time, for conducting the inspection or $75 per registered portable engine or equipment unit inspected.

Appendix C

ECONOMIC IMPACT ANALYSIS

Table 1 - Total Fee Increase Attributed to Amendments to the PERP Regulation	
Cumulative Impact (Assumes 5-Year Life + One-Time Costs)	
Cumulative Impact From Renewal And Administration Fee Increase	$1,385,000
Cumulative Impact From Obtaining a District Permit	$415,000
Cumulative Impact From Hour Meter Installation	$79,000
Cumulative Impact From Non-Operational Registration	$30,000
Cumulative Impact From Recordkeeping	$301,000
Total Fee Increase Attributed to Amendments to the PERP Regulation	**$2,210,000**
Breakout of Impacts:	
Businesses:	
Cumulative Impact From Renewal And Administration	$984,000
Cumulative Impact From Obtaining a District Permit	$295,000
Cumulative Impact From Hour Meter Installation	$56,000
Cumulative Impact From Non-Operational Registration	$21,000
Cumulative Impact From Recordkeeping	$214,000
Total Cumulative Impact - Businesses	**$1,570,000**
Total Cumulative Impact - Small Businesses	**$1,099,000**
State Agencies:	
Cumulative Impact From Renewal And Administration	$17,000
Cumulative Impact From Obtaining a District Permit	$5,000
Cumulative Impact From Hour Meter Installation	$1,000
Cumulative Impact From Non-Operational Registration	<$1,000
Cumulative Impact From Recordkeeping	$4,000
Total Cumulative Impact - State Agencies	**$27,000**
Local Agencies:	
Cumulative Impact From Renewal And Administration	$48,000
Cumulative Impact From Obtaining a District Permit	$14,000
Cumulative Impact From Hour Meter Installation	$3,000
Cumulative Impact From Non-Operational Registration	$1,000
Cumulative Impact From Recordkeeping	$10,000
Total Cumulative Impact - Local Agencies	**$76,000**

Table 1 - Total Fee Increase Attributed to Amendments to the PERP Regulation (Cont.)	
Federal Agencies:	
Cumulative Impact From Renewal And Administration	$336,000
Cumulative Impact From Obtaining a District Permit	$101,000
Cumulative Impact From Hour Meter Installation	$19,000
Cumulative Impact From Non-Operational Registration	$7,000
Cumulative Impact From Recordkeeping	$73,000
Total Cumulative Impact - Federal Agencies	**$536,000**

Table 2 Registration and Renewal Fees for Statewide Registration Program
(Fees are per registered unit except where noted otherwise)

1	Initial Registration	~~$90.00~~	$270.00
2	Tactical Support Equipment Initial Registration		
A	Registration of first 25 units (or portion thereof)	~~$1500.00~~	$1500.00
B	Registration of every additional 50 units (or portion thereof)	~~$1500.00~~	$1500.00
~~3~~	~~Non-operational portable engines or equipment units~~		
~~A~~	~~Without initial evaluation~~	~~$30.00~~	
~~B~~	~~With initial evaluation~~	~~$60.00~~	
~~4~~ 3	Change of status from non-operational to operational		
A	Where initial evaluation has not been previously completed	~~$60.00~~	$180.00
B	Where initial evaluation has been previously completed	~~$30.00~~	$90.00
~~5~~ 4	Identical Replacement	~~$15.00~~	$75.00
~~6~~	~~Equivalent replacement (treated as a new registration, fees are the same as above for new registration)~~	~~$90.00~~	
~~7~~ 5	Renewal every 3 years		$225.00
~~A~~	~~Every 3 years per registered portable engine or equipment unit~~	~~$90.00~~	
~~B~~	~~Pro-rated yearly per registered portable engine or equipment unit~~	~~$30.00~~	
~~C~~	~~Non-operational 3 years (prorated @ $10/year) per registered portable engine or equipment unit~~	~~$30.00~~	
~~D~~	~~Change of status from operational to non-operational plus non-operational renewal~~	~~$45.00~~	
~~8~~ 6	Renewal for tactical support equipment every 3 years		
A	Renewal of first 25 units (or portion thereof)	~~$750.00~~	$1125.00
B	Renewal of every additional 50 units (or portion thereof)	~~$750.00~~	$1125.00
~~9~~ 7	Penalty fee for late renewal payments ~~per registered portable engine or equipment unit~~		
A	~~30-60 days after receiving renewal notice~~ Postmarked within 2 calendar months prior to registration expiration date	~~$15.00~~	$45.00
B	~~60-90 days after receiving renewal notice~~ Postmarked within the calendar month prior to registration expiration date	~~$30.00~~	$90.00
C	~~90 days after receiving renewal notice~~ Postmarked after registration expiration date	~~$45.00~~	$250.00
~~10~~ 8	Modification to registered portable engine or equipment unit	~~$15.00~~	$75.00
~~11~~ 9	Change of ownership ~~per registered portable engine or equipment unit~~	~~$15.00~~	$75.00
~~12~~ 10	Replacement of registration identification device	~~$10.00~~	$30.00
11	Correction to an engine or equipment unit description		$45.00
12	Update company information, copy of Registration documents		$45.00
13	Copy of Registration documents		$45.00
~~13~~ 14	District inspection fee per registered portable engine or equipment unit inspected	$75.00	$75.00

Table 3 - Administrative and Renewal Fee Cost Analysis

ADMINISTRATIVE FEE INCREASE:	# OF UNITS AFFECTED PER YEAR			3 Yr-Average	New Fee	(w/proposed fees)
	2002	2001	2000			
Change of Ownership	221	167	257	215	$75	$16,125
Company Information Update	14	2	24	13	$45	$585
Correction on Certificate or Operating Conditions	7	13	15	12	$45	$540
Identical Replacement	41	109	49	67	$75	$5,025
Modification to Engine or Emissions Controls	35	142	166	114	$75	$8,550
Modification to Equipment or Emissions Controls	17	4	3	8	$75	$600
Sticker Replacement Request	116	76	46	79	$30	$2,370
Total Proposed Administrative Fees:						**$33,795**
Total Proposed Administrative Fees	$33,795					
3 Year annual Average Administrative Fees Received	$8,627					
Total ADMINISTRATIVE FEE INCREASE:	**$25,168**					

Table 3 - Administrative and Renewal Fee Cost Analysis (Continued)						
RENEWAL FEE INCREASE:	**# Of UNITS RENEWED PER YEAR**			**3-yr Average**	**New Fee**	**(w/proposed fees)**
	2002	**2001**	**2000**			
Engine Renewal (Does Not Include TSE)	1,343	2,136	1,496	1,658	$225	$373,050
Equipment Reneweal (Does Not Include TSE)	161	191	16	123	$225	$27,675
Total						**$400,725**
TSE:	**TSE-$ RECEIVED FOR RENEWAL PER YEAR**					
	2002	**2001**	**2000**	3-yr Average		
TSE *Increase Based On 1.5 Times 3Yr Annual Average	$32,147	$31,942	$15,000	$26,363	1.5X	**$39,545**
Total Proposed Renewal Fees:						**$440,270**
Total Proposed Renewal Fees	$440,269					
3 yr Annual Average Renewal Fees Received	$188,533					
TOTAL RENEWAL FEE INCREASE:	**$251,736**					
TOTAL ANNUAL IMPACT FROM PROPOSED FEE INCREASE:						
Administrative Fee Increase:	$25,168					
Renewal Fee Increase	$251,736					
TOTAL ANNUAL IMPACT FROM PROPOSED FEE INCREASE:	**$276,904**					
CUMULTIVE IMPACT FROM PROPOSED FEE INCREASE (5 YEARS)	**$1,384,520**					

Table 4 - Obtaining a District Permit Cost Analysis	
Number of Active Engines and Equipment Private	15,739
Number of Active Engines and Equipment State	270
Number of Active Engines and Equipment Local	769
Number of Active Engines and Equipment Federal	5,368
Total Active Engines and Equipment	22,146
Number of Private Businesses	1,205
Number of Small Businesses	844
Number of State Agencies	9
Number of Local Agencies	103
Number of Federal Agencies	41
# of Engines/Equipment (0.5% Must Get Permits - Private)	79
# of Engines/Equipment (0.5% Must Get Permits - State)	1
# of Engines/Equipment (0.5% Must Get Permits - Local)	4
# of Engines/Equipment (0.5% Must Get Permits - Federal)	27
Assumed Cost for Permitting	$750
Assumed Cost for Renewal	$750
Average Cost for Permitting - Private (0.5%)	$59,021
Average Cost for Permitting - State (0.5%)	$1,013
Average Cost for Permitting - Local (0.5%)	$2,884
Average Cost for Permitting - Federal (0.5%)	$20,130
Total Average Annual Cost for Permitting:	**$83,048**
Average Cost for Renewal - Private (0.5%)	$59,021
Average Cost for Renewal - State (0.5%)	$1,013
Average Cost for Renewal - Local (0.5%)	$2,884
Average Cost for Renewal - Federal (0.5%)	$20,130
Total Average Annual Cost for Renewal:	**$83,048**
Total Cumulative Impacts from District Permitting and Renewal (5-Years):	
Total Cumulative Impact Private	**$295,106**
Total Cumulative Impact State	**$5,063**
Total Cumulative Impact Local	**$14,419**
Total Cumulative Impact Federal	**$100,650**
Total Cumulative Impact From District Permitting and Renewal	**$415,238**

Table 4 - Obtaining a District Permit Cost Analysis (CONTINUED)	
Breakout of Costs:	
Impacts to Small and Typical Businesses:	
Average One-Time Cost Impact Small Business	$0
Average Annual Cost Impact Small Business	$41,314.88
Average One-Time Cost to a Small Business:	$0
Average Annual Cost to a Small Business	$0 - $3,750
Total Cumulative Impact From District Permitting and Renewal - Small Business (5 Years)	**$206,574**
Average One-Time Cost to a typical Business	$0
Average Annual Cost to a typical Business	$0
Total Cumlative Impact From District Permitting and Renewal - Typical Business (5 Years)	**$295,106**

Table 5 : District Survey For Permitting Portable Engines

District	Unit	Initial Fee	Annual Renewal	3 Year Total
YSAQMD	IC Engine 50-249 bhp	$288	$144	$576
	IC Engine 250-499 bhp	576	288	$1152
	Portable Equipment (Rule 3.3)	200	150	$500
SDAPCD	Portable Engine	363	125	$613
	Portable Equipment (Rule 12.1)	200	150	$500
SJVUAPCD	Portable Equipment (Rule 3150)	150	90	$330
SACAQMD	IC Engine 50-249 bhp	506	253	$1012
	IC Engine 250-499 bhp	1056	528	$2112
	IC Engine 499-999 bhp	2024	1012	$4048
SCAQMD	IC Engine 51-500 bhp	1370	195	$1760
	IC Engine >500 bhp	2167	701	$3569
	Concrete Batch Plant (Rule 2100)	2167	701	$3569
PERP	Concrete Batch Plant	270	-	$270
	IC Engine	270	-	$270
Some districts may add additional fees for complex applications. Some districts may add emission rate fees.				

Table 6 - Recordkeeping Cost Analysis	
# of Generators	**6,013**
Cost for Recordkeeping per engine	**$100**
Assumed Number of Engines used for Emergency Electrical Generation	**601**
Total Cost For Recordkeeping	**$60,100**
Total Number of Units Currently Registered	22146
State Entity Registered Units	270
Local Entity Registered Units	769
Federal Entity Registered Units	5368
Private Business Units	15739
% State Units	1.22
% Local Units	3.47
% Federal Units	24.24
% Private Business Units	71.07
% Small Business Units	70
Total Annual Impact Small Business	**$29,899**
Total Cumulative Impact Small Business (5 Years)	**$149,494.20**
	Annual Cost
Annual Impact State	**$733**
Annual Impact Local	**$2,087**
Annual Impact federal	**$14,568**
Annual Impact Private Business	**$42,713**
Total Impact	**$60,100**
Total Recordkeeping Cumulative Impact (5 Years)	**$300,500**

Table 7 - Non-Operational Units Cost Analysis	
# of units with engineering analysis	4
# of units without engineering analysis	50
Cost to register unit with Engineering analysis	$90
Cost to register unit without Engineering analysis	$180
Cost to Renew	$225
Total cost to Register non-operational units	$9,360
% State Units	1.22
% Local Units	3.47
% Federal Units	24.24
% Private Business Units	71.07
% Small Business Units	70
	One-Time Cost
One-Time Impact- State	$114
One-Time Impact- Local	$325
One-Time Impact- Federal	$2,269
One-Time Impact- Business	$6,652
Total One-Time Non-Operational Impact	**$9,360**
Renewal Fees ($75/year x 5 years)	**$20,250**
Annual Impact - State	$247
Annual Impact - Local	$703
Annual Impact - Federal	$4,908
Annual Impact - Business	$14,392
Total Non-Operational Impact Cumulative (5Yrs) - State	$361
Total Non-Operational Impact Cumulative (5Yrs) - Local	$1,028
Total Non-Operational Impact Cumulative (5Yrs) - Federal	$7,177
Total Non-Operational Impact Cumulative (5Yrs) - Business	$21,044
Total Non-Operational Impact Cumulative (5Yrs)	**$29,610**

Table 8 - Hour Meter Cost Analysis	
# of Generators	6,013
# of Generators with Hour Meters	5,199
# of Generators without Hour Meters	814
Cost for Hour Meter (with installation)	$195
# of hour meters needed (Assumed 50%)	407
Total Cost For Hour Meters	**$79,365**
% State Units	1.22
% Local Units	3.47
% Federal Units	24.24
% Private Business Units	71.07
% Small Business Units	70
	One-Time Cost
One-Time Impact- State	$968
One-Time Impact- Local	$2,756
One-Time Impact- Federal	$19,237
One-Time Impact- Private Business	$56,404
Total Hour-Meter Cumulative Impact	**$79,365**
Total One-Time Impact Small Business	$39,483

Table 9 - Breakout of Costs								
			Small Business			Typical Business		
	State	Local	Total	Low Estimate	High Estimate	Total	Low Estimate	High Estimate
Permit Fees	(all agencies)	(all agencies)	(all businesses)	(per business)	(per business)	(all businesses)	(per business)	(per business)
One Time	$0	$0	$0	$0		$0		$0
Annual	$1,013	$2,884	$41,315	$0	$3,750	$59,021	$0	$1,500
Total Program (5 Years)	$5,063	$14,419	$206,574			$295,106		
Renewal and Admin								
One Time	$0	$0	$0	$0		$0		$0
Annual	$3,376	$9,615	$137,756	$160	$360	$196,794	$830	$1,830
Total Program (5 Years)	$16,880	$48,076	$688,780			$983,968		
Recordkeeping								
One Time	$0	$0	$0	$0		$0		$0
Annual	$733	$2,087	$29,899	$0	$500	$42,713	$1,000	$3,000
Total Program (5 Years)	$3,665	$10,435	$149,495			$213,565		
Hour Meters								
One Time	$968	$2,756	$39,483	$0	$975	$56,404	$0	$5,850
Annual	$0	$0	$0	$0		$0		$0
Total Program (5 Years)	$968	$2,756	$39,483			$56,404		
Non-Operational Units								
One Time	$114	$325	$4,656	$0	$180	$6,652	$0	$360
Annual	$246	$700	$10,074	$0	$75	$14,392	$0	$150
Total Program (5 Years)	$360	$1,025	$14,730			$21,044		
	Low	High						
A Small Business Initial	$0	$1,155						
A Typical Business Initial	$0	$6,210						
A Small Business Annual	$160	$4,685						
A Typical Business Annual	$1,830	$6,480						
Lifetime Cost Business	$1,570,087							
Lifetime Cost Small Business	$1,099,062							
Small Business annual cost for lifetime of Regulation (Lifetime cost/5)	$219,812							
Local Annual	$15,611							
State Annual	$5,482							

Appendix D:

List of Acronyms and Abbreviations

LIST OF ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
ARB or Board	Air Resources Board
ARB staff or Staff	Air Resources Board staff
BACT	Best Available Control Technology
bhp	Brake-horsepower
CAA	Federal Clean Air Act
CAPCOA	California Air Pollution Control Officers Association
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CO	Carbon monoxide
Diesel PM	Diesel Particulate Matter
Districts	Air Pollution Control Districts or Air Quality Management Districts
DOF	Department of Finance
g/bhp-hr	Grams per brake horsepower-hour
HSC	California Health and Safety Code
ISOR	Initial Statement of Reasons
LAER	Lowest Achievable Emission Rate
NMHC	Non-methane hydrocarbons
NOx	Oxides of nitrogen
NSR	New Source Review
PERP program	Statewide Portable Equipment Registration Program
PM	Particulate matter
Portable Engine ATCM	Proposed Airborne Toxic Control Measure for Diesel Particulate Matter from Portable Engines Greater than 50 Horsepower
ROG	Reactive organic gases
SB	Senate Bill
SIP	State Implementation Program
Statewide Regulation	Statewide Portable Equipment Registration Program Regulation
TACs	Toxic Air Contaminants
TSE	Tactical support equipment
U.S. EPA	United States Environmental Protection Agency
Workgroup	Portable Equipment Workgroup