TITLE 13. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER PROPOSED MODIFICATIONS TO THE EXHAUST EMISSION STANDARDS AND TEST PROCEDURES - 1985 AND SUBSEQUENT MODEL YEAR HEAVY-DUTY URBAN BUS ENGINES AND VEHICLES, THE FLEET RULE FOR TRANSIT AGENCIES, AND ZERO-EMISSION BUS REQUIREMENTS

The Air Resources Board (the Board or ARB) will conduct a public hearing at the time and place noted below to consider adoption of amendments to the urban bus engine exhaust emission standards, the fleet rule for transit agencies, and the zero emission bus requirements. The amendments would establish a new standard for the certification of diesel hybrid-electric buses, require transit agencies purchasing these diesel hybrid-electric buses to offset the increased emissions of oxides of nitrogen (NOx), and modify the zero emission bus demonstration project requirements. This notice summarizes the significant amendments. The Initial Statement of Reasons, or staff report, presents all of the proposed amendments in greater detail.

DATE: June 24, 2004

TIME: 9:00 a.m.

PLACE: Air Resources Board
Auditorium
9530 Telstar Ave.
El Monte, CA 91731

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., June 24, 2004, and may continue at 8:30 a.m., June 25, 2004. This item may not be considered until June 25, 2004. Please consult the agenda for the meeting, which will be available at least 10 days before June 24, 2004, to determine the day on which this item will be considered.

This facility is accessible to persons with disabilities. If you have special accommodation or language needs, please contact the ARB's Clerk of the Board at (916) 322-5594 or landreon@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 amendment to title 13, California Code of Regulations, sections 1956.1, 1956.2, 1956.3, and 1956.4.

Background: In February 2000 the Board confirmed its continued commitment toward improving emissions from public transportation by establishing a new fleet rule for transit agencies and more stringent emission standards for new urban bus engines and vehicles. The rule also promoted advanced technologies by adopting a zero-emission bus (ZEB) demonstration and ZEB acquisition requirements for transit agencies.

Recognizing the progressive nature of the regulations, the Board directed staff to report back regularly on implementation progress and to develop a test procedure to certify hybrid-electric urban buses (HEBs). Staff reported back to the Board at its September 20, 2001, and March 21, 2002, public meetings. As instructed by the Board, staff brought modifications to the fleet rule for transit agencies and a test procedure for certification of HEBs to the Board, which were adopted at the October 24, 2002, public hearing.

Staff is bringing this proposal to the Board to make amendments not addressed in the October 24, 2002, hearing. Staff is proposing modifications to the exhaust emission standards and test procedures for heavy-duty urban bus engines and vehicles, to the fleet rule for transit agencies, and to the ZEB requirements.

This rulemaking has two purposes. First, staff is proposing a mechanism in this rulemaking to allow the purchase by certain transit agencies of diesel HEBs for the 2004 through 2006 model years (MY). Second, staff is proposing modifications to the ZEB program to conform with current and potential future market conditions and availability of ZEBs. Staff is not, at this time, proposing to modify the 2007 engine exhaust emission standards for urban bus engines and vehicles.

Staff expects a small positive effect on emissions from the amendments it is proposing to the engine exhaust emission standards for urban buses and vehicles. Staff's proposal would allow manufacturers to sell a MY 2004 through 2006 diesel HEB certified to standards of 1.8 grams per brake horsepower-hour (g/bhp-hr) oxides of nitrogen (Nox) and 0.01 g/bhp-hr particulate matter (PM). Transit agencies on the diesel path would be allowed to purchase those diesel HEBs, provided they offset the difference between 1.8 g/bhp-hr NOx and the current diesel urban bus engine standard of 0.5 g/bhp-hr NOx. Offsets can be obtained through installing a retrofit device that reduces NOx emissions or repowering to a lower emitting diesel or alternative-fuel engine.

In addition to the changes to the urban bus engine standards, staff also is proposing to revise the ZEB demonstration program by reducing the number of concurrent fuel cell buses and extending the time period for the demonstration projects. At the time the transit bus regulation was developed, staff believed that the research and development of fuel cells would result in their application in transit buses before their application in light duty vehicles. The reverse has occurred, and manufacturers are focusing their efforts on developing light duty

vehicle fuel cell applications. Despite the exemplary efforts of the transit agencies, the demonstration program is therefore behind schedule and staff is proposing changes to match the program goals with the current status of technology.

The proposed regulation amendments have no associated costs for implementation because the changes do not mandate purchases. Rather, the amendments provide the opportunity for transit agencies to purchase new diesel HEBs from 2004 through 2006. In addition, there is no added cost to the proposal to modify the ZEB demonstration. Staff expects there will be benefits to businesses that produce or sell diesel HEBs.

COMPARABLE FEDERAL REGULATIONS

California's urban bus emission standards are more stringent than the federal requirements until 2010. Currently there are no federal emission standards for zero-emission or hybrid-electric buses.

AVAILABILITY OF DOCUMENTS AND CONTACT PERSONS

The Board staff has prepared a Staff Report: Initial Statement of Reasons for the proposed regulatory action (ISOR), which includes a summary of the economic and environmental impacts of the proposal. The report is titled: "Proposed Modifications to the Exhaust Emission Standards and Test Procedures - 1985 and Subsequent Model Year Heavy-Duty Urban Bus Engines and Vehicles, the Fleet Rule for Transit Agencies, and Zero-Emission Bus Requirements."

Copies of the ISOR and the full text of the proposed regulatory language, in underline and strikeout format to allow for comparison with the existing regulations, may be accessed on the ARB's web site listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, California 95814, (916) 322-2990 at least 45 days prior to the scheduled hearing June 24, 2004.

Upon its completion after the Board hearing, 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 regulation may be directed to Ms. Kathleen Mead, Air Pollution Specialist, by email at kmead@arb.ca.gov or by phone at (916) 324-9550, or to Dr. Nancy L.C. Steele, Manager, by email at nsteele@arb.ca.gov or by phone at (626) 350-6598.

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 landreon@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 www.arb.ca.gov/regact/bus03/bus03.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, or other nondiscretionary savings to state or local agencies.

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

The Executive Officer has also determined, pursuant to title 1, CCR, section 4, that the proposed regulatory action will not affect small businesses because the modifications are discretionary and do not affect any small businesses.

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the Board or that has otherwise been identified and brought to the attention of the Board 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.

FINDING OF NECESSITY FOR REPORTS

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the Executive Officer finds 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.

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, June 23, 2004**, and addressed as follows:

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: **bus03@listserv.arb.ca.gov** and received at the ARB **no later than 12:00 noon, June 23, 2004**.

Facsimile transmissions 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 June 23, 2004.**

The Board requests but does not require that 30 copies of any written statement be submitted and that all written 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 Board 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 that authority granted in Health and Safety Code sections 39600, 39601, 39659, 39667,39701, 41511, 43013, 43018, 43100, 43101, 43104, and 43806, and section 28114 of the Vehicle Code. This action is proposed to implement, interpret and make specific sections 39002, 39003, 39017, 39018, 39033, 39500, 39650, 39657, 39667, 39700, 39701, 40000, 41510, 41511, 43000, 43000.5, 43009, 43013, 43018, 43102, 43701(b), 43801, 43806 of the Health and Safety Code, and section 233 and 28114 of the Vehicle Code.

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 approve 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 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: April 27, 2004

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS

PROPOSED MODIFICATIONS TO THE EXHAUST EMISSION STANDARDS AND TEST PROCEDURES - 1985 AND SUBSEQUENT MODEL YEAR HEAVY-DUTY URBAN BUS ENGINES AND VEHICLES, THE FLEET RULE FOR TRANSIT AGENCIES, AND ZERO-EMISSION BUS REQUIREMENTS

Date of Release: May 7, 2004
Scheduled for Consideration: June 24-25, 2004

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
California Environmental Protection Agency
AIR RESOURCES BOARD

PROPOSED MODIFICATIONS TO THE EXHAUST EMISSION STANDARDS AND TEST PROCEDURES - 1985 AND SUBSEQUENT MODEL YEAR HEAVY-DUTY URBAN BUS ENGINES AND VEHICLES, THE FLEET RULE FOR TRANSIT AGENCIES, AND ZERO-EMISSION BUS REQUIREMENTS

Staff Report

May 7, 2004

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LIST OF ACRONYMS

$/lb	Dollars per pound
AC Transit	Alameda/Contra Costa Transit District
ARB, or the Board	Air Resources Board
CCR	California Code of Regulations
CO	Carbon monoxide
FCB	Fuel cell bus
g/bhp-hr	Grams per brake horsepower-hour
GGT	Golden Gate Bridge Highway and Transportation District
GVWR	Gross vehicle weight rating
HC	Hydrocarbon
H&SC	Health and Safety Code
HEB	Hybrid-electric bus
lbs/day	Pounds per day
Low sulfur diesel fuel	Diesel fuel with less than 15 ppmw sulfur content
MY	Model year
Moyer Program	Carl Moyer Memorial Air Quality Standards Attainment Program
NO_x	Oxides of nitrogen
PM	Particulate matter
Ppmw	Parts per million by weight
SamTrans	San Mateo County Transit District
Tpd	Tons per day
U. S. EPA	United States Environmental Protection Agency
VTA	Santa Clara Valley Transit Transportation Authority
ZEB	Zero-emission Bus

EXECUTIVE SUMMARY

The major goal of the Air Resources Board (ARB or "the Board") is to provide clean, healthful air to all the citizens of California. California's commitment to providing clean public transportation is an important part of achieving this goal. Public transportation has important societal benefits, providing access to work and education, reducing traffic congestion, and meeting mobility needs of the public.

In February 2000 the Board confirmed its continued commitment toward improving emissions from public transportation by establishing a new fleet rule for transit agencies and more stringent emission standards for new urban bus engines and vehicles. The rule promoted advanced technologies by adopting a zero-emission bus (ZEB) demonstration and ZEB acquisition requirements for larger transit agencies.

Recognizing the progressive nature of the regulations, the Board required staff to report back regularly on implementation progress and to develop a test procedure to certify hybrid-electric urban buses (HEBs). Staff has reported back to the Board at its September 20, 2001, and March 21, 2002, public meetings. As instructed by the Board, staff brought modifications to the fleet rule for transit agencies and a test procedure for certification of HEBs to the Board, which were adopted at the October 24, 2002, public hearing.

Staff is bringing this proposal to the Board to make amendments not addressed in the October 24, 2002, hearing. Specifically, staff is proposing modifications to the exhaust emission standards and test procedures for heavy-duty urban bus engines and vehicles, to the fleet rule for transit agencies, and to the ZEB requirements.

This rulemaking has two purposes. First, staff is proposing a mechanism in this rulemaking to allow the purchase by certain transit agencies of diesel HEBs from 2004 through 2006 model year (MY). Second, staff is proposing modifications to the ZEB program to conform with current and potential future market conditions and availability of ZEBs. Staff is not, at this time, proposing to modify the 2007 engine exhaust emission standards for urban bus engines and vehicles.

Staff expects a small positive effect on emissions from the amendments it is proposing to the engine exhaust emission standards for urban buses and vehicles. Staff's proposal would allow manufacturers to sell a MY 2004 through 2006 diesel HEB certified to standards of 1.8 grams per brake horsepower-hour (g/bhp-hr) oxides of nitrogen (NOx) and 0.01 g/bhp-hr particulate matter (PM). Transit agencies on the diesel path would be allowed to purchase those diesel HEBs, provided they offset the difference between 1.8 g/bhp-hr NOx and the current diesel urban bus engine standard of 0.5 g/bhp-hr NOx. Offsets can be

obtained through installing a retrofit device that reduces NOx emissions or repowering to a lower emitting diesel or alternative-fuel engine.

In addition to the changes to the urban bus engine standards, staff also is proposing to revise the zero emission bus demonstration program by reducing the number of concurrent fuel cell buses and extending the time period for initiation and completion of the demonstration projects. At the time the transit bus regulation was developed, information available to staff indicated that the research and development of fuel cells would result in their application in transit buses before their application in light duty vehicles. The reverse has occurred, and manufacturers are focusing their efforts on developing light duty vehicle fuel cell applications. Despite the exemplary efforts of the transit agencies, the demonstration program is, therefore, behind schedule and staff is proposing changes to match the program goals with the current status of technology.

The proposed regulatory amendments have no associated costs for implementation because the changes do not mandate purchases. Rather, the amendments provide the opportunity for transit agencies to purchase new diesel HEBs from 2004 through 2006. In addition, there is no added cost as a result of the proposal to modify the ZEB demonstration program. Staff expects there will be benefits to those businesses that produce or sell diesel HEBs.

The proposed modifications, as described herein, are consistent with the authority of the ARB to control emissions from mobile sources. To maintain current emission reduction goals set for transit buses in 2000, the ARB staff, therefore, recommends that the Board adopt the proposed modifications to sections 1956.1, 1956.2, 1956.3, and 1956.4, title 13, California Code of Regulations, set forth in the proposed Regulation Order in Appendix A.

I. INTRODUCTION

The major goal of the Air Resources Board (ARB or "the Board") is to provide clean, healthful air to the citizens of California. California's commitment to providing clean public transportation is an important part of achieving this goal. Public transportation has important societal benefits, including providing access to work and education, reducing traffic congestion, and meeting the mobility needs of the public, including the elderly and physically challenged.

Most types of public transportation, however, are also sources of polluting engine exhaust emissions. Oxides of nitrogen (NOx) and hydrocarbons (HC) contribute to the atmospheric formation of ozone and fine particles. Diesel particulate matter (PM) is a toxic air contaminant – a cancer-causing pollutant that also has significant short- and long-term negative cardiovascular impacts. These emissions often occur within California's most populated areas. It is, therefore, vital to all Californians that the ARB continue its efforts to reduce engine exhaust emissions from all sources, specifically transit buses, which are the subject of this rulemaking.

In February 2000, the Board confirmed its continued commitment toward improving emissions from public transportation by establishing a new fleet rule for transit agencies and more stringent emission standards for new urban bus engines and vehicles. The multi-faceted regulations were designed to reduce NOx, an ozone precursor, and PM by setting fleet emission reduction requirements that encouraged transit agencies to purchase cleaner buses and retrofit their existing buses. The rule promoted advanced technologies by adopting a zero-emission bus (ZEB) demonstration and ZEB acquisition requirements applicable to larger transit agencies. New, more stringent mid- and long-term emission standards were adopted that apply to new urban bus engines.

Recognizing the progressive nature of the regulations, the Board required staff to report back regularly on implementation progress and to develop a test procedure to certify hybrid-electric urban buses (HEBs). Staff has worked closely with transit agencies to encourage compliance and reported back to the Board at its September 20, 2001, and March 21, 2002, public meetings. As instructed by the Board, staff brought modifications to the fleet rule for transit agencies and a test procedure for certification of HEBs to the Board, which were adopted at the October 24, 2002, public hearing.

Staff is bringing this proposal to the Board to make amendments to sections of the rules not addressed in the October 24, 2002, hearing. Staff is proposing modifications to the exhaust emission standards and test procedures for heavy-duty urban bus engines and vehicles, to the fleet rule for transit agencies, and to the ZEB requirements.

This rulemaking has two purposes. First, staff is proposing a mechanism to allow the certification, sale, and purchase of diesel HEBs, for the 2004 through 2006 model years (MY). At the time of the rulemaking, the Board was asked by several witnesses to provide a way for HEBs to be sold in California. Staff developed interim certification procedures, which the Board adopted in October 2002. With the 2004 model year, however, the current rule requires those engines to meet the very low California 2004 urban bus engine exhaust emission standards, which they are unable to meet. The benefits anticipated from the development of HEB technology and the offsets that transit agencies will need to supply in order to compensate for the loss of NOx reduction benefits justifies this approach.

Second, staff is proposing modifications to the ZEB program to conform with current and potential future market conditions and the availability of ZEBs. The ZEB demonstration program is behind schedule. ARB staff has been closely monitoring activities and the delay is a consequence of conditions out of the transit agencies' control. The amendments to the ZEB program are necessary and appropriate.

Staff is not, at this time, proposing to modify the 2007 engine exhaust emission standards for urban bus engines and vehicles. Staff had raised the issue of aligning California's urban bus standards for 2007 and beyond with the California and federal heavy duty truck standards, and had entertained comments on this proposal at public workshops, but has since decided not to propose this change in this rulemaking.

II. BACKGROUND

California's regulations applicable to transit agencies and the manufacturers of urban bus engines and vehicles are innovative and go beyond the federal requirements for urban buses. Since rule adoption, many transit agencies have installed natural gas refueling infrastructure and purchased alternative-fuel urban buses; repowered diesel engines to cleaner exhaust emission standards; installed diesel particulate filters on diesel engines; and experimented with developing technologies, such as HEBs and cleaner fuels. Many of California's transit agencies consider themselves to be innovators and incubators for advanced technologies.

A. Applicability

The Fleet Rule for Transit Agencies regulates transit buses that are owned or leased by public transit agencies and that meet the definition of an urban bus. An urban bus is a bus that is normally powered by a heavy heavy-duty diesel engine, or of a type that would normally be powered by a heavy heavy-duty diesel engine. These buses are generally 35 feet in length or longer. Urban

buses usually operate on a fixed route consisting of stops and starts as passengers are routinely picked up and delivered to their destinations. Commuter bus operations within metropolitan areas (such as the Yolo-Sacramento metropolitan area) that consist of more than a few pick-up and drop-off stops are also considered to fall within the definition of urban bus operation.

B. *Engine Exhaust Emission Standards for Urban Buses*

The "Exhaust Emission Standards and Test Procedures - 1985 and Subsequent Model Heavy-Duty Urban Bus Engine and Vehicles" are codified in title 13, California Code of Regulations (CCR), section 1956.1. The requirements set forth engine exhaust emission standards for urban bus engines and vehicles operating in California. Beginning October 1, 2002, all diesel-fueled, dual-fuel, and bi-fuel urban bus engines were required to meet a 0.01 grams per brake horsepower-hour (g/bhp-hr) PM emission standard. Beginning with the 2004 MY, diesel urban bus engines must meet new NOx emission standards of 0.5 g/bhp-hr, and with the 2007 MY all urban bus engines must meet new emission standards of 0.2 g/bhp-hr NOx.

California's exhaust emission standards for urban buses are, in most years, more stringent than the federal requirements for urban buses until 2010. California and federal heavy duty truck engine exhaust standards, however, are the same. Tables 1 and 2 below list both California and federal NOx and PM emission standards for urban bus engines. In addition to the mandatory emission standards listed in Tables 1 and 2, the ARB also has optional, reduced-emission standards, which were integrated into the February 2000 urban transit bus emission standard. The optional reduced-emission standards for NOx are listed in Table 3 below.

Table 1. California and Federal NOx Emission Standards for Urban Bus Engines

Emission Standards (g/bhp-hr)		
Model Year	California	Federal
1988	6.0	10.7
1990	6.0	6.0
1991	5.0	5.0
1996	4.0	5.0
1998	4.0	4.0
October 2002	2.2(1)	2.2(1)
2004	0.5(2), 2.2(3)	2.2(1)
2007	0.2	1.2 (4)
2010	0.2	0.2(4)

1. Nominal expected NOx level based on emission standards of 2.4 g/bhp-hr NOx plus non-methane hydrocarbons (NMHC) or 2.5 g/bhp-hr NOx plus NMHC with 0.5 g/bhp-hr NMHC cap to take effect in October 2002 for those engines subject to the Settlement Agreements between the heavy-duty engine manufacturers, the United States Environmental Protection Agency (U.S. EPA), and ARB. As part of the Settlement Agreements, the federal heavy-duty engine emission standards adopted for 2004 took effect in October 2002.

2. Standard applies to urban bus equipped with diesel-fuel, dual fuel, or bi-fuel, engines.

3. Standard applies to urban bus equipped with alternative-fueled engines. Nominal expected NOx level based on ARB emission standards of 2.4 g/bhp-hr NOx plus NMHC or 2.5 g/bhp-hr NOx plus NMHC with 0.5 g/bhp-hr NMHC.

4. Between 2007 and 2009, U.S. EPA requires 50% of heavy duty diesel engine family certifications to meet the 0.2 g/bhp-hr NOx standard. Averaging is allowed, and it is expected, most engines will conform to a NOx standard of approximately 1.2 g/bhp-hr.

Table 2. California and Federal PM Emission Standards for Urban Bus Engines

Emission Standards (g/bhp-hr)		
Model Year	**California**	**Federal**
1988	0.6	0.6
1991	0.1	0.25
1993	0.1	0.1
1994	0.07	0.07
1996	0.05(1)	0.05(1)
October 2002	0.01(2)	0.05
2007	0.01	0.01

1. In-use standard of 0.07 g/bhp-hr.
2. Standard applies to urban bus equipped with diesel-fuel, dual fuel, or bi-fuel, engines. Urban bus equipped with alternative fueled engines may certify to optional standard of 0.03, 0.02, or 0.01 g/bhp-hr.

Table 3. California Optional, Reduced-Emission Standards for Urban Buses

Emission Standard (g/bhp-hr)		
Model Year	**Optional Standards**	**Increment**
2000 – 10/2002	2.5 - 0.5	0.5
10/2002 – 2003	1.8-0.3	0.3
2004 – 2006[1]	1.8-0.3	0.3

1. Emission standards apply only to alternative fueled engines.

In January 2001, after California adopted its current 2007 urban bus exhaust emission standard, the U.S. EPA completed its 2007 heavy-duty engine exhaust emission rulemaking and adopted "Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements." Although the final NOx emission standard is the same, there are significant differences between California's standards for new urban bus engines and the federal 2007 engine standards. California's standards require all urban bus engines to certify to 0.2 g/bhp-hr NOx as of the 2007 MY. The federal heavy-duty engine standard allows the 0.2 g/bhp-hr NOx standard to be phased-in as a percentage of sales: 50 percent in 2007 through 2009 and 100 percent in 2010 and beyond.

C. Hybrid-Electric Bus Technology

Hybrid-electric buses utilize an advanced technology that achieves lower emissions and better fuel economy than equivalently sized diesel buses. Hybrid-electric propulsion systems combine two motive power sources: an energy storage system such as a battery pack or ultracapacitors, and an internal combustion engine, turbine, or fuel cell functioning as an auxiliary power unit. An electric motor provides partial or complete power to the wheels. In addition, energy otherwise lost as heat during braking is captured through regenerative braking to charge the energy storage system.

Transit buses and delivery trucks with frequent stop-and-go drive cycles are ideal for hybrid-electric applications. The energy storage system is used during periods of initial acceleration, which are usually high emission episodes. Regenerative braking during frequent stops recharges the energy storage system. As the engine is not the sole power source in hybrid-electric drive trains, a smaller engine can be used and operated at high efficiency and low emissions. Emissions testing studies at the ARB and other facilities indicate a fuel consumption reduction of 25 percent and NOx emission reduction of about 50 percent for diesel-fueled HEBs compared to conventional diesel transit buses (ARB 2002). Emission testing studies of gasoline-fueled HEBs indicate even more significant NOx emission reductions compared to conventional diesel and Compresses Natural Gas (CNG) transit buses.

1. California Interim Certification Procedures

Recognizing the projected emission benefits of HEBs, the Board directed ARB staff to develop a test procedure that would allow manufacturers to demonstrate and claim the emission benefit of the electric motor. Certification through engine dynamometer testing does not reflect the emission benefits of the hybrid-electric drive system. Staff developed the interim certification procedures to provide early flexibility and ensure long-term benefits. The Board adopted the "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes" (interim certification procedures) on October 24, 2002.

The interim certification procedures provide a method for manufacturers to quantify the emission reductions attributable to hybrid-electric drive systems through a combination of chassis dynamometer and engine dynamometer testing. To facilitate introduction of this technology in California, manufacturers may simply claim a 25 percent reduction from the engine's NOx certification value during the interim period of 2004-2006. Alternatively, manufacturers may perform chassis testing to determine the full emission benefits of the hybrid-electric drive system. Manufacturers are also allowed relaxed useful life and durability requirements for the hybrid-electric drive system during the interim period of 2004-2006.

To date, one manufacturer, ISE, has certified a hybrid-electric drive system for use in urban buses. ISE received certification for a hybrid-electric drive system incorporating a gasoline engine in October 2003. The ISE hybrid-electric drive system, when installed in a bus chassis, is classified as an alternative-fuel bus, and the system is certified under the optional NOx standards (Table 3) at 0.6 g/bhpr-hr.

2. Hybrid-Electric Transit Bus Projects

HEBs have been in revenue service in the United States for the past six years. In 1998, New York City Transit began a demonstration program with four diesel-fueled HEBs. The success of the program has resulted in New York City Transit ordering an additional 325 diesel-fueled HEBs, which it will receive through 2005.

The past two years have seen a shift from research and development to production and use of HEBs. In January 2002, fewer than 100 HEBs were in active service. To date, orders have been placed for approximately 650 additional HEBs throughout the United States. In addition to the New York City Transit order, large orders have been placed by King County Metro in Seattle, Washington (213 diesel hybrid buses) and Long Beach Transit in California (27 gasoline hybrid buses).

The commercialization of hybrid-electric drive system technology for transit buses is encouraging; however, the industry is still in a relatively early stage. The complete emission and fuel economy benefits of this technology will be realized with continued refinements made to HEBs currently available.

D. Fleet Rule for Transit Agencies

The fleet rule for transit agencies sets fleet-wide requirements applicable to each transit agency. Thus, each transit agency must consider its fleet as a whole to meet emission reduction goals. Initially, each transit agency was required to select a compliance path – either the "diesel" path or the "alternative-fuel" path, by January 1, 2001. Path selection set the fuel type for urban bus purchases or leases through model year 2015. Transit agencies on either path were required to achieve a maximum fleet average of 4.8 g/bhp-hr NOx as of October 1, 2002, but PM and ZEB requirements differ depending on the path selected. Diesel path agencies are required to reduce PM emissions and purchase ZEBs sooner than those on the alternative fuel path.

The October 24, 2002, rule amendments were primarily focused on changing the mechanism for PM reduction because of the unavailability of technology for the oldest engines (ARB 2002). Further, any transit agency on the diesel path and located in the South Coast Air Basin was allowed to switch its fuel path to alternative-fuel path, provided the transit agency was in compliance with the rule. Additional changes allowed diesel path agencies to purchase 2004 through 2006 model year alternative-fuel engines; provided a "financial hardship" delay request mechanism for small transit agencies; repealed the certification procedures for PM retrofit devices as duplicative of another, recently adopted rule; and made other conforming and clarifying changes.

E. Zero Emission Bus Regulation

The Board adopted the ZEB requirements (title 13, CCR, section 1956.3) in 2000 as part of the comprehensive fleet rule for transit agencies within California. The development of zero emission transportation is key to California's long-term clean air strategy and the ZEB regulation establishes demonstration and acquisition criteria for each large transit agency to further that goal.

Zero emission technologies include battery electric buses, electric trolley buses with over-head twin-wire power supply, and fuel cell electric buses. A "zero-emission bus" is defined as producing zero exhaust emissions of any criteria or precursor pollutant under any and all possible operational modes and climates. "Criteria pollutants" are those for which the ARB has adopted ambient air quality standards.

1. ZEB Demonstration

Any transit agency on the diesel path that has more than 200 urban buses as of January 31, 2001, is required to implement a ZEB demonstration project. Up to three transit agencies can participate in any one joint project, provided the project does not utilize electric trolley buses.

Key components and milestones of the demonstration project are as follows:

- Transit agencies were to prepare bid proposals for materials and services necessary to implement the demonstration project no later than January 1, 2002.
- The required ZEBs were to be in revenue service no later than July 1, 2003.
- Transit agencies were to place at least three ZEBs in revenue service per participating agency, but up to three transit agencies in an air basin could petition to implement a joint demonstration project.
- The buses must be in revenue service for a minimum duration of 12 calendar months.
- Transit agencies are to submit a report on the demonstration project to the ARB's Executive Officer no later than January 31, 2005.
- The ARB is to review ZEB technology and the feasibility of implementing the purchase provision of the program (described below) no later than January 2006.

2. ZEB Purchase Requirements

Large transit agencies (those with more than 200 buses) on both fuel paths are required to implement the ZEB purchase component of the program on a phased-in schedule. For transit agencies on the diesel fuel path, a 15 percent aggregate total of all bus acquisitions from model year 2008 through model year 2015 must be ZEBs. For transit agencies on the alternative fuel path, the 15 percent ZEB acquisition requirement starts with model year 2010 and runs through model year 2015. Transit agencies on the diesel path must submit a compliance plan by January 2007 and transit agencies on the alternative fuel path must submit a compliance plan by January 2009. Any request for deviation from the ZEB purchase requirement must be submitted to, and approved by, the Executive Officer prior to the transit agency's submittal of the purchase order.

3. Progress on the Demonstration Project

In 2001 there were 71 transit agencies reporting to the ARB. Of these, only five of the 44 transit agencies on the diesel path met the criteria for having to implement a ZEB demonstration project (Table 4).

Table 4. ZEB Demonstration Transit Agencies

Transit Agencies Required to Implement a ZEB Demonstration Project
Alameda/Contra Costa Transit District
Golden Gate Bridge Highway and Transportation District
San Francisco Municipal Railway
San Mateo County Transit District
Santa Clara Valley Transportation Authority

Of the five eligible transit agencies, four are participating in fuel cell bus demonstrations and the fifth, San Francisco Municipal Railway, is using its electric trolley fleet to meet the ZEB demonstration requirements. The four transit agencies formed two partnerships, with Alameda/Contra Costa Transit District (AC Transit) being joined by Golden Gate Bridge Highway and Transportation District (GGT), and Santa Clara Valley Transportation Authority (VTA) being joined by San Mateo County Transit District (SamTrans). In addition, SunLine Transit Agency joined the AC Transit and GGT partnership voluntarily and will purchase one bus.

The transit agencies selected fuel cell powered buses as the technology most likely to cost-effectively meet the required performance standards and emission requirements in the long term. As explained below, however, implementation is behind schedule and adjustments to the program are necessary.

III. PUBLIC OUTREACH AND ENVIRONMENTAL JUSTICE

The ARB is committed to ensuring that all California communities have clean, healthful air by addressing not only the regional smog that hangs over our cities but also the more localized toxic pollution that is generated within our communities. The ARB works to ensure that all individuals in California, especially children and the elderly, can live, work and play in a healthful environment that is free from harmful exposure to air pollution.

A. Environmental Justice

On December 13, 2001, the Board approved Environmental Justice Policies and Actions,[1] which formally established a framework for incorporating environmental justice into the ARB's programs, consistent with the directives of State law and policy (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 environmental justice issues have been raised more in the context of low-income and minority communities because of past land use policies and the

[1] Complete information for these programs can be found at http://www.arb.ca.gov/ch/ej.htm.

accumulative impact of a concentration of emitting facilities in some neighborhoods.

To achieve this ambitious goal, the ARB has established a Community Health Program and emphasized community health issues in our existing programs. To prove people with basic tools and information needed to understand and participate in air pollution policy planning, permitting, and regulatory decision-making processes, ARB has published, "The Public Participation Guide to Air Quality Decision Making in California."[2]

The Environmental Justice 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 we need to engage community members in a meaningful way as we carry out our 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 stakeholders; communities, environmental and public health organizations, industry, business owners, other agencies, and all other interested parties to successfully implement these Policies. Our outreach efforts, described below, facilitate this objective.

B. Outreach Efforts

The ARB strives to involve the widest number of affected persons in the development of its regulations. To this end, staff held informal public workshops and meetings prior to publishing the notice and staff report. For this rule, staff conducted four public workshops (Table 5) and additional focused meetings. Notices for the workshops were mailed to over 1,800 individuals and companies and were posted to ARB's Public Transit Agencies web site and e-mailed to subscribers of ARB's electronic list server. Those workshops held in Sacramento were webcast for individuals who could not travel to the meeting locations. To generate additional public participation and to enhance the information flow between ARB and interested persons, staff made all documents, including workshop presentations, available via the Public Transit Agencies web site.[3] In addition, the web site provides background information and serves as a portal to other web sites with related information.

[2] Complete information on this program can be found at http://www.arb.ca.gov/ch/public_participation.htm
[3] http://www.arb.ca.gov/msprog/bus/bus.htm

Table 5. Workshop Locations and Times.

Date	Location	Time
December 2, 2003	El Monte	1:30 – 3:00 PM
December 3, 2003	Sacramento	1:30 – 3:00 PM
March 29, 2004	Sacramento	1:30 – 3:00 PM
March 30, 2004	El Monte	1:30 – 3:00 PM

Attendees of the workshops included representatives from environmental organizations, transit agencies, engine manufacturers, bus manufacturers, air pollution control districts, cities and counties, the California Association for Coordinated Transportation, Regional Council of Rural Counties, Manufacturers of Emission Control Association, Engine Manufactures Association, California Department of Transportation, California Natural Gas Association, California Energy Commission, consultants, and other parties interested in transit bus emissions.

Staff met with a number of the same stakeholders in focused meetings throughout the rulemaking process to get feedback on staff's proposed regulatory modifications. These stakeholders represent transit agencies; manufacturers of engines, hybrid-electric drive systems, and buses; natural gas advocates; and environmental organizations. Staff attended and made presentations at the California Transit Association conference in November 2003 and the California Association for Coordinated Transportation conference in April 2004. Staff also worked closely with ZEB stakeholders, including AC Transit, VTA, SunLine Transit, California Energy Commission, National Renewable Energy Laboratory, South Coast Air Quality Management District, Ballard Power Systems (Ballard), ISE , and United Technologies Corporation Fuel Cells. Alternatives were suggested to the proposed regulation and explored by staff.

IV. NEED FOR REGULATORY MODIFICATIONS

A. Hybrid-Electric Buses

Only seven transit agencies,[4] out of the 44 which are on the diesel path, may purchase 2004 through 2006 MY diesel engines that are certified to the 2.4 g/bhp-hr NOx + NMHC standard. Those seven transit agencies were approved by the Executive Officer in 2001 to take advantage of the "alternative NOx strategy exemption" found in title 13, CCR, section 1956.2 (c)(8) and (d)(7). The rest of the transit agencies on the diesel path currently have no options, other than repowering their diesel engines, to purchase cleaner diesel engines,

[4] AC Transit, El Dorado Transit, Eastern Contra Costa Transit, GGT, Merced Transit, Visalia Transit, and VTA.

because they simply are not being manufactured or certified at the required California standard.

For a short time, from October 1, 2002, through the 2003 model year, transit agencies could purchase a diesel urban bus engine certified to 2.5 g/bhp-hr NOx and 0.01 g/bhp-hr PM. As of 2004, however, the NOx standard dropped to 0.5 g/bhp-hr NOx and no manufacturer has certified an engine to meet that standard. Thus, most transit agencies on the diesel path can only repower older engines but cannot purchase new buses without converting to alternative fuels.

Staff believes that transit agencies on the diesel path should be provided with the cleanest, most aggressive diesel choice available, which currently is diesel HEB technology. Thus, staff is proposing to encourage turnover of the oldest, dirtiest diesel engines by creating a special certification standard for manufacturers of diesel HEBs during the 2004-2006 MY time period. Diesel HEBs are in use in other states and two transit agencies have experimental permits to operate diesel HEBs in California. Staff evaluated current engine technology and found that no diesel HEB could meet the California 2004 diesel urban bus engine exhaust emission standard of 0.5 g/bhp-hr NOx. Staff believes the diesel HEBs could, however, meet a NOx standard of 1.8 g/bhp-hr and a PM standard of 0.01 g/bhp-hr.

In order to purchase the higher NOx emission diesel HEBs, a transit agency would be required, through amendment of the fleet rule for transit agencies, to offset the increased NOx emissions through NOx reductions elsewhere in the fleet. A transit agency could accomplish this, for example, by installing NOx aftertreatment technology on its remaining diesel buses or repowering an older bus with an engine certified to lower NOx emissions. Neither NOx aftertreatment nor repowering with a cleaner engine is required under the fleet rule for transit agencies, so these emission savings would be surplus to other requirements and thus available to offset any NOx increases from purchasing diesel HEBs. Staff is proposing that this option only be for transit agencies on the diesel path, as there is an alternative-fueled HEB already certified and available to transit agencies on the alternative fuel path.

B. Fleet Rule for Transit Agencies

In order to accomplish the changes discussed above, ARB will need to amend the fleet rule for transit agencies to allow diesel path agencies to purchase diesel HEBs and to include a requirement and methodology that, at the same time, reduces NOx emissions from diesel HEB purchases and use. The requirement would be similar to the existing alternative NOx strategy exemption. A transit agency would be required to submit a plan demonstrating how it would offset NOx emissions from diesel HEB purchases to the ARB Executive Officer, and after plan approval could go ahead with the purchase of diesel HEBs. A follow-up report would confirm compliance.

C. Zero Emission Bus Demonstration

At the time the transit bus regulation was developed, information available to staff indicated that the research and development of fuel cells in transit buses would lead to their deployment in transit buses before their application in light duty vehicles. Buses are better suited to handle the relatively larger size and weight of fuel cells and on-board fuel storage. In addition, the deployment of fuel cells in a controlled fleet application would allow fueling and service requirements to be performed at a single facility, thereby helping to mediate infrastructure and support issues in the early years. As it turns out, fuel cell and vehicle manufacturers instead focused their resources on developing light duty fuel cell applications.

After reviewing the status of technology and bus availability, therefore, staff sees a need to revise the number of concurrent, in-use fuel cell buses that must be demonstrated and extend the time period for the demonstration projects. Currently the regulation requires that each participant place a minimum of three ZEBs in revenue service and that the demonstration be completed in time to allow completion of a report by January 2005. Despite the exemplary efforts of the transit agencies, the demonstration projects face significant challenges. The projects are over one year behind schedule and each project requires additional ZEBs. As there are two transit agencies partnered in each demonstration project, an additional six fuel cell buses (FCBs) would be required. These FCBs, however, will not be delivered in time to allow the demonstration to be completed prior to January 2005.

The transit agencies have demonstrated due diligence in attempting to comply with the demonstration requirements. For example, AC Transit and VTA, the lead transit agencies of the two ZEB demonstrations, individually initiated efforts to develop ZEB programs as the ZEB regulation was being promulgated. Transit agencies solicited bids for the purchase of FCB with sufficient lead time to meet regulatory requirements. However, transit agencies experienced difficulties in receiving responses from fuel cell and bus manufacturers. The FCBs for the VTA demonstration are not expected until second quarter 2004 and the FCBs for AC Transit are not anticipated to be delivered until fourth quarter 2005. As a result, the in-revenue demonstrations of the FCBs will start over one year after the currently required start date.

In addition, the cost of buses is greater then anticipated. At the time of the original rulemaking, in 1999, ARB estimated that by 2001 the cost for a demonstration FCB would be in excess of $1 million and by 2003/2004 an FCB would be around $550,000 to $790,000, which is cost competitive with electric trolley buses. The cost of an FCB for this initial demonstration, however, is greater then $3 million. By soliciting partners, the lead transit agencies were able to secure additional funding to allow the demonstrations to go forward despite the increases in cost.

Staff has considered several options to solve this issue, such as allowing transit agencies to acquire the FCBs at a future date and allowing initial FCBs to be retrofit with improved fuel cell or zero emission technology-enabling componentry. After analysis, staff believes the cost of the current buses, the state of technology, and the availability of data from European fuel cell buses justify simply reducing the number of buses required in California to three per demonstration project, instead of three per transit agency, which brings the costs of the demonstration project back to that projected in the original rulemaking.

V. SUMMARY OF PROPOSED REGULATIONS

Staff recommends that the Board adopt proposed amendments to sections 1956.1, 1956.2, 1956.3, and 1956.4 of title 13, as set forth in Appendix A. All the provisions in the proposed amendments apply to engines and vehicles produced for sale in California. There are three components to this proposal:

- Add a 2004 –2006 engine exhaust emission standard of 1.8 g/bhp-hr NOx and 0.01 g/bhp-hr PM for diesel HEBs;
- Add emission reduction requirements to the fleet rule for transit agencies for the purchase of diesel HEBs; and
- Modify the zero-emission bus demonstration project.

A. Amendment to the Urban Bus Emission Standard, title 13, CCR, section 1956.1(a)(11)

Staff proposes to add a new subsection to the 2004 to 2006 model year diesel-fueled, dual-fuel, and bi-fuel urban bus engine standards (all of which use diesel fuel) to allow for a diesel HEB to be certified at a 1.8 g/bhp-hr NOx and 0.01 g/bhp-hr PM exhaust emission standard.

The intended effect of the change is to set the lowest technologically feasible emission standard for diesel HEBs to encourage manufacturers to produce and sell diesel HEBs in California. Additional fleet requirements for transit agencies are proposed in this rulemaking in order to offset emission increases from diesel HEB purchases, relative to the existing urban bus NOx standard for MY 2004 through 2006.

B. Amendments to the Fleet Rule of Transit Agencies, title 13, CCR, section 1956.2

1. Add a Definition of Hybrid-electric Bus

Staff proposes to add a definition for "hybrid-electric bus." The proposed definition is modeled on the definition in the "California Interim Certification

Procedures for 2004 and Subsequent Model Hybrid-electric Vehicles, in the Urban Bus and Heavy-duty Vehicle Classes," incorporated by reference in title13, CCR, section 1956.1(c).

"Hybrid-electric bus" would be defined as an urban bus equipped with at least two sources of energy on board; this energy is converted to motive power using an electric drive motor and an auxiliary power unit, which converts consumable fuel energy into mechanical or electrical energy. The electric drive motors must be used partially or fully to drive the vehicle's wheels.

No impact will result from this change, as the definition is already being used in the certification procedure for hybrid-electric buses.

2. Add Transit Agency Requirements for Purchase of Diesel-fueled HEB

Staff is proposing that a new section be added to the existing regulation that provides for procedures for offsetting NOx emissions that would result from the purchase and operation of diesel HEBs that meet the less stringent NOx exhaust emission standard. This provision would only apply to transit agencies on the diesel path. Transit agencies on the alternative-fuel path would not be allowed to purchase a diesel HEB, as there is already a certified alternative-fuel HEB available.

The new provision requires the diesel HEB to be certified at the proposed standard set forth in section 1956.1(a)(11); provides a specific calculation to be used to quantify emission reductions; and provides a mechanism whereby ARB's Executive Officer approves the actions to offset the emission increases that would result from operating a diesel HEB. This provision also includes reporting requirements outlined in title 13, CCR, section 1956.4.

C. Amendment to the Zero-emission Bus Rule, title 13, CCR, section 1956.3

Staff proposes to reduce the number of buses required to three buses per demonstration project, as opposed to three buses per participant, and to revise the start date of the demonstration to February 28, 2006. These changes more accurately reflect the cost and expected availability of the FCBs. In addition, staff is recommending to add an interim demonstration status report due July 31, 2005, and to delay the final project report until July 31, 2007.

D. Amendment to Reporting Requirements, title 13, CCR, section 1956.4

Staff is proposing that a new section be added to the existing regulations that provides for a mechanism to allow the Executive Officer to receive applications and decide on the merits of exhaust emission offset actions proposed by a transit agency that chooses to purchase diesel HEBs. Transit agencies would be

required to submit a plan prior to purchasing diesel-fueled HEBs. The application would need to include the number of diesel HEBs to be purchased and specific actions, such as the addition of NOx aftertreatment technology or number and types of engines to be repowered, to reduce NOx emissions. The Executive Officer would have up to 90 days to consider the transit agency's request and analysis, and render a decision. Prior to receipt of the last HEB, the transit agency must provide a report documenting implementation of the plan. A transit agency would be responsible for providing any plan changes or updated information to the Executive Officer.

VI. AVAILABILITY AND TECHNOLOGICAL FEASIBILITY OF CONTROL MEASURE

A. Diesel-fueled Hybrid Electric Buses

The collaborative efforts of hybrid-electric drive system developers, engine manufacturers and bus builders have resulted in HEBs utilizing a variety of fuel and energy storage systems. Advanced battery technologies and ultracapacitors are available in current buses. HEBs with engines or turbines using diesel, gasoline, CNG, or propane are commercially available.

Transit agencies are interested in diesel HEBs because of the compatibility with current fueling structure and familiarity with diesel engine technology. Diesel HEBs have lower exhaust emissions and better fuel economy compared to conventional diesel buses. The number of diesel HEBs in revenue service throughout the United States is expected to triple in the next few years as transit agencies incorporate this promising technology in their fleets.

B. Zero-Emission Bus Requirements

In addition to reducing the public's exposure to smog forming emissions the transit bus regulation aimed to reduce toxic air contaminants and be technology forcing by requiring zero-emission engines. Zero emission transportation technology is a key component in California's long-term clean air strategy. As the ZEB regulation was being developed, fuel cell technology had demonstrated greater potential to meet transit agencies' power, range, and refueling requirements then battery electric zero emission buses and offered greater route flexibility and focused infrastructure needs when compared to over-head wire trolley buses. Buses equipped with direct hydrogen, proton exchange membrane (PEM) fuel cells or with, on-board methanol reforming, phosphoric acid fuel cells had been demonstrated successfully. In addition, fuel cell manufacturers anticipated being production ready by 2003.

It was believed that transit bus applications would lead light-duty vehicles' development and deployment. Buses are better suited to handle the relatively larger size and weight of pre-production fuel cell and fuel storage systems. The

deployment of fuel cells in a controlled fleet application would allow fueling and service requirements to be performed at a single facility, thereby helping to mediate infrastructure and support concerns. In addition, transit agencies routinely train staff; therefore applicable staff could be trained for proper servicing or operation of fuel cells.

Based on demonstrated performance, expected cost and availability, transit agencies viewed the fuel cell engine as the transportation industry's environmental solution and eagerly initiated efforts to further test and evaluate fuel cell buses. For example, AC Transit and VTA, the lead transit agencies of the ZEB demonstrations, individually initiated efforts to develop ZEB programs as the ZEB regulation was being developed.

The transit agencies initiated project planning and developed bids for the purchase of FCBs with sufficient lead-time to meet regulatory requirements. Much, if not all, of the planning and needs for implementing the ZEB demonstration proved to be groundbreaking and required creative and persistent effort from the transit agencies.

As it turns out, vehicle and fuel cell manufactures exerted great efforts on developing light duty fuel cell applications therefore focussing resources on light duty applications. In addition, Ballard, one of the fuel cell manufacturers, dedicated significant resources to meeting production requirements for the Clean Urban Transport in Europe (CUTE) 30-bus demonstration. While the number of buses deployed for the CUTE demonstration likely added to the delay in the California demonstration, the information will be valuable for aiding fuel cell development.

In addition, the cost of buses is greater then anticipated and not expected to decrease significantly in the near future. The cost of a bus for this initial demonstration is greater then $3 million. At the time of the original rulemaking, in 1999, it was estimated that by 2001 the cost for a demonstration fuel cell bus would be around $1 million and by 2003/2004 a FCB would be around $550,000 to $790,000, which is cost competitive with electric trolley buses. Through additional efforts the lead transit agencies were able to secure funding to allow the demonstrations to go forward despite the increases in cost. Despite the exemplary efforts of the transit operators, the demonstration projects will not be in compliance. The projects are over one year behind schedule and each project requires additional buses in order to comply with the California regulation.

Since the causes for the delay in the FCB demonstrations are outside of the control of the transit agencies, staff recommends moving the deadline for the placement of the fuel cell buses from July 1, 2003, to February 28, 2006. Contract agreements specify that the required buses will have been delivered by then and most of the buses will have been delivered and placed into operation prior to this date.

Staff considered options that would allow compliance with the number of zero emission buses currently required, such as allowing transit agencies to acquire the FCBs at a future date or allowing initial FCBs to be retrofit with improved fuel cell or zero emission technology-enabling componentry. Allowing the initial FCBs to be retrofit with improved fuel cell or zero emission technology-enabling componentry has the potential to reduce costs. This initial deployment of buses required the development and construction of chassis specific for fuel cell applications. Allowing the reuse of the initial buses could help eliminate cost associated with bus development, electric drive components, fuel storage, and, if applicable, electric energy storage. In addition to the cost savings for the transit agencies, the deployment of an updated fuel cell is more likely to foster fuel cell development then additional deployments of the same technology.

In order to determine if retrofitting the initial buses could result in savings to the transit agencies, staff contacted the FCB providers and integrators. While this report is not intended to contain a thorough state of technology evaluation, staff did meet with technology providers and system integrators to discuss the potential amendments.

The VTA bus demonstration uses a Ballard fuel cell system that is identified as a model P-5. The P-5 is used to supply all system power requirements. The P-5 is also used in CUTE the 30-bus demonstration project in Europe. At this time Ballard does not plan to develop an upgraded P-5 fuel cell. The next fuel cell system is likely to differ extensively therefore making a retrofit of one of the initial FCBs not cost effective.

The AC Transit FCB demonstration, a hybrid design, was designed with retrofit capabilities in mind and uses a fuel cell from UTC along with batteries to meet power requirements. Even with the retrofit capabilities any cost savings will be limited as the upgraded fuel cell requires similar support systems. In addition, at this time UTC, the fuel cell provider for this project, does not have a projected date for a revised fuel cell. For both fuel cell providers, the next generation fuel cell is not expected for at least three years and is not expected to provide significant cost reductions at the anticipated production volume of three buses.

Based on comments received from Ballard and UTC, it appears unlikely that an improved fuel cell will become available within the next three years. Therefore, allowing a current FCB to be retrofit with an improved fuel cell is not likely to provide a additional useful information within the next three years. After considering the number of buses in demonstrations world wide, the cost of the buses, and the state of the technology staff recommends reducing the number of buses required to three per demonstration project.

While reducing the number of buses required will decrease the amount of information gathered from California demonstrations, sufficient information will be

available to allow a technology assessment by January 31, 2006. For example, the transit agencies plan to operate the buses for at least two years of in-revenue demonstration. SunLine Transit partnered with AC Transit and will be independently operating a fuel cell powered bus. This will provide a third fuel cell bus demonstration in California that will be operated under different climate conditions then the AC Transit and VTA demonstrations. And, information will have been collected from the CUTE demonstration.

In addition to delaying the placement date and the number of buses required, staff is recommending changes to the reporting requirements by requiring an interim report by July 31, 2005, as a new requirement, and moving the date of the project report from January 31, 2005, to July 31, 2007, which would allow the report to include information on at least 12 months of in-revenue service.

VII. REGULATORY ALTERNATIVES

No alternative considered by the ARB would be more effective in carrying out the goals previously endorsed by the Board in the 2000 regulation than the proposed modifications, nor would any alternative be both as effective and least burdensome to affected private persons than the proposed modifications. The following options were considered in reaching this conclusion.

A. Do Not Adopt This Regulation

Not adopting this regulation would have the continued effect of prohibiting the sale of diesel HEBs in California from 2004 through 2006 to most transit agencies, and would leave the four transit agencies mandated to demonstrate ZEB technology in violation of the regulation. California's regulations for transit agencies and urban buses are innovative and go beyond the federal requirements for urban buses. At the time they were adopted, it was anticipated that changes may be necessary based upon the state of the technology. Not adopting this regulation would also result in higher emissions than the proposal, because newer buses could not be purchased to replace older, higher emitting diesel buses.

Since the original rule adoption in 2000, many transit agencies have installed natural gas refueling infrastructure and purchased alternative-fuel urban buses; repowered diesel engines to engines meeting cleaner exhaust emission standards; installed diesel particulate filters in diesel engines; and experimented with developing technologies, such as hybrid-electric engines and cleaner fuels. Many of California's transit agencies continue to take on the challenge to be innovators and incubators for advanced technologies. Not adopting these amendments would hurt the continuing efforts to advance innovative technologies needed to meet future emission objectives.

Staff does not recommend the Board endorse the "no change" alternative.

B. Adopt a Lower NOx Emission Standard for Diesel HEBs

Staff has evaluated the technology and emission levels achieved by diesel HEBs and does not believe that adopting an emission standard for diesel HEBs lower the 1.8 g/bhp-hr standard proposed herein would result in the certification and sale of diesel HEBs. Staff believes this alternative would have the same result as not adopting the proposal.

Staff does not recommend the Board endorse a lower NOx emission standard for diesel HEBs alternative.

C. Do Not Amend the ZEB Requirements

The Board could decide not to change the number of buses or the time frame specified in the ZEB demonstration requirements. However, as discussed, the demonstration deadline has already passed and it would not be productive to penalize transit agencies that operated in good faith to acquire the buses prior to the deadline. Similarly, the buses are significantly more expensive than previously estimated and additional worldwide fuel cell transit projects make it less critical to demonstrate the original number of ZEBs in California prior to the Board's review of the technology.

Staff does not recommend the Board endorse the "do not amend the ZEB requirements" alternative.

VIII. ECONOMIC IMPACT

A. Legal Requirement

Sections 11346.3 and 11346.5 of the Government Code require 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 out-of-state businesses.

State agencies are also required to estimate the cost or savings to any state or local agency and school districts in accordance with instructions adopted by the Department of Finance. This estimate is to include any nondiscretionary costs or savings to local agencies and the costs or savings in federal funding to the state.

B. Affected Manufacturers

Businesses that may be affected as a result of the proposed regulation include manufacturers of advanced, hybrid electric vehicles/engines, and urban bus

manufacturers. One business that manufactures hybrid-electric engines is located in California, therefore most impacts to these businesses, both positive and negative, will occur in other states.

C. Potential Impacts on Businesses

Currently no diesel hybrid-electric bus has been certified for sale or use in California. The proposed amendments should have a positive impact on diesel HEB system and bus manufacturers by allowing them to certify and sell their products in California during 2004 through 2006. Thus, staff's proposal opens up the market for diesel hybrid-electric urban buses, allowing engine manufacturers, bus manufactures, and system integrators to sell their products in California between 2004 and 2006. These amendments do not impose a mandate to produce but open a potential market by allowing the sale and purchase of diesel hybrid-electric urban buses.

One California manufacturer, ISE, has certified a gasoline HEB. This manufacturer may see a decline in projected orders because of competition from the newly-allowed diesel HEBs. Staff believes, however, that there will be a net increase in HEBs purchased by California transit agencies as a consequence of this proposal based on conversations with transit agencies that have stated they would only purchase a diesel HEB and would not purchase the gasoline HEB. In addition, staff's proposal is that transit agencies on the alternative-fuel path would not be allowed to purchase diesel HEBs, thus maintaining the ISE gasoline HEB as the only HEB for these agencies.

D. Potential Impact on Small Businesses

Staff is not aware of any small businesses that are affected by this regulatory change.

E. Potential Costs to Local Agencies

Staff has concluded that there are no significant adverse fiscal impacts on any state or local agencies. Transit agencies on the diesel path currently cannot purchase diesel HEBs beginning with the 2004 MY engines because no HEBs are certified to in California. Opening up the diesel HEB market provides transit agencies with more flexibility to achieve emission reductions and increase ridership.

The new diesel-fueled HEB requirements are optional. If a transit agency opts to purchase this technology between 2004 and 2006, staff estimates that the resulting reporting and emission control device costs will be incorporated into their current budgets. Extending the deadline for the ZEB demonstration and reducing the number of fuel cell buses required to be demonstrated will not result

in a cost increase for transit agencies; rather they can spread the cost for the project over a longer period of time.

The proposed modification would impose no costs on government-contracted (publicly-contracted), and government (publicly-owned) transit agencies.

F. Potential Impact on Business Competitiveness

Staff believes there will be an effect on business competitiveness as it affects ISE, a California company that manufactures, and has certified, a gasoline HEB. Other companies that make diesel HEBs will likely benefit from this proposed rule, perhaps to the detriment of ISE's market. Currently, the market for hybrid-electric buses in California is confined to ISE as no other manufacturer has certified an HEB in California. Transit agencies, however, appear reluctant to purchase the ISE gasoline HEB, probably as there are none yet in commercial operation. Transit agencies that have ordered the ISE gasoline HEB are those under the jurisdiction of the South Coast AQMD, which are required by local rules to purchase only alternative-fueled buses when adding to their fleets. Other transit agencies, which might have purchased the ISE gasoline HEB, may instead wait and purchase a diesel HEB if one is certified following adoption of this proposal. Thus ISE may lose some of its potential market.

G. Potential Impact on Employment

Staff believes there may be a positive affect on employment as a result of the adoption of the proposed modifications as engine and bus manufacturers obtain additional orders from California transit agencies. Most transit agencies are currently prevented from purchasing diesel buses because no manufacturer has chosen to meet the emission standard for NOx imposed by the current rule.

IX. ENVIRONMENTAL IMPACT AND COST EFFECTIVENESS

A. Benefits

Staff believes there will be no business elimination, and believes there will be no or minimal business creation or expansion, as a result of the adoption of the proposed modifications.

1. Statewide Benefits

Staff expects a small positive emission benefit from the diesel HEB purchase amendments proposed for 2004 through 2006 through increased turnover of old, dirty diesel engines that are replaced by the diesel HEBs (Table 6). Staff assumed that 150 diesel HEBs would be placed in service in 2006, replacing 150 old diesel buses. No emission benefits would accrue prior to 2006 because of the lead time necessary to order, manufacture, and place buses into revenue

service, and those emission benefits are expected to continue into the future until the buses are replaced. Because any transit agency that purchases a diesel HEB must offset the difference between 1.8 g/bhp-hr and 0.5 g/bhp-hr, the model assumes that all of the 150 modeled diesel HEBs emit at the 0.5 g/bhp-hr rate.

Table 6. Statewide Urban Bus Fleet Emission Inventory for 2006 Compared to the Proposal

Calendar Year 2006:	NOx (tpd)	PM (lbs/day)
Current Estimate (No Purchases)	17.7	450
Staff's Proposal	17.4	440
Emission Benefit	**0.3**	**10**

Staff expects there to be a very small, unquantifiable effect from the reduction in ZEBs to be demonstrated.

2. Cost-Effectiveness of Proposed Regulation

The estimated cost-effectiveness of the original transit agency regulation was detailed in the December 1999 Initial Statement of Reasons (ARB 1999). Staff determined the cost-effectiveness of the engine emission standards and zero-emission bus purchase requirements to be about $1.80/lb of NOx in 2010 and $1.50/lb in 2020. This proposal does not change the expected cost-effectiveness determined at that time. As explained elsewhere, these proposed amendments provide transit agencies with the option to purchase diesel HEBs 2004 through 2006. These rules are not a mandate to purchase and thus impose no additional cost on transit agencies. In addition, staff's proposal cuts the number of ZEBs demonstrated by one-half and extends the time, thus spreading out the cost over a longer time period.

B. Potential Negative Impacts

Staff does not expect any negative impacts from this proposal.

X. ISSUES

Over the course of development of this proposal, staff has met many times with various stakeholders and received written and verbal comments. Although staff has considered each comment, not all issues could be resolved. Following is a discussion of major outstanding issues.

A. HEBs Should Receive a NOx Emission Reduction of Greater Than 25 Percent from the Engine Certification Value.

Studies have indicated that HEBs have NOx emission reductions on the order of 50 percent lower than conventional transit buses. However, as seen in light-duty

hybrid-electric vehicles, hybrid-electric drive systems can be designed to maximize specific attributes such as fuel economy or emission reductions. Without emissions test data on a specific system, it is appropriate to be conservative in assigning emission benefits. Manufacturers are permitted to demonstrate a greater NOx emission benefit for a HEB by using the hybrid-electric drive system test procedures in the interim certification procedures. They will receive the benefit of any demonstrated reduction. Therefore, staff believes the current NOx emission reduction allowed for interim certification of HEBs through engine certification alone is appropriate.

B. HEBs Should Not be Required to Meet Urban Bus Engine Durability

Conventional urban bus engines are required to meet a useful life of 12 years or 435,000 miles. This is both a California and a federal requirement. As previously discussed, hybrid system manufacturers often utilize smaller medium-heavy-duty engines as part of their systems to take advantage of the improved fuel economy of the smaller engine. These smaller engines have been demonstrated to meet durability requirements for only 185,000 miles.

For model years 2004 through 2006, the ARB has implemented interim hybrid certification procedures, which provide flexibility and options for the developing hybrid industry. One of the options the ARB has permitted is for a manufacturer to claim a 25 percent NOx benefit from the engine certification value without conducting any additional emissions testing. Under this option, however, hybrid-electric drive system manufacturers may not simply utilize any engine. Instead, manufacturers must use an engine already certified to the urban bus emission standards and useful life requirement.

Some manufacturers have requested that this option should be expanded to allow them to use the smaller medium-heavy-duty engines, which are not currently certified as an urban bus engine. Staff agrees some balance is necessary in assisting markets to develop for new technologies, especially when the hybrid drivetrain or hybrid bus manufacturer is the party seeking the certification. Rather than certify hybrid drive systems or buses without any demonstration of durability, as some have requested, staff has already provided that the demonstration of durability of the system or bus may be limited to 150,000 miles, through the 2006 model year. Further, certification staff will work with the applicant to assure exiting data are used whenever possible to further reduce the time and cost of certification.

C. HEBs Should be Allowed to Meet the PM Emission Standard with an ARB-Verified Aftertreatment Device.

The currently available diesel HEBs meet the federal 2004 PM emission standard of 0.05 g/bhp-hr. Hybrid-electric drive system manufacturers have indicated an interest in meeting the California PM emission standard of 0.01 g/bhp-hr through the use of a verified particulate filter on an engine not certified to the California urban bus emission standards. An engine manufacturer may include a verified particulate filter (verified following California's verification procedures) on a California certified engine by submitting additional testing data and a justification for use. However, California engine certification procedures do not allow a third party to add an aftertreatment device to meet California emission standards. This ensures that the end-user has a durable, reliable product that the manufacturer has warranted.

Alternatively, a manufacturer may certify the hybrid-electric drive system using one-party certification of the hybrid-electric drive system instead of engine certification. With one-party certification, the hybrid-electric drive system as a package must meet urban bus emission standards, but the certified engine incorporated into the hybrid-electric drive system is not required to meet the urban bus emission standards. In this case, the manufacturer could apply an aftertreatment system to a truck engine, but still would be required to warrant the device as part of the hybrid-electric drive system.

XI. SUMMARY AND STAFF RECOMMENDATION

A. Summary of Staff's Proposal

As presented in the previous sections, the ARB staff's proposal is designed to continue its commitment to innovative technology by removing barriers to California's market place. ARB staff acknowledges that the 2000 rulemaking is a "technology-forcing" regulation. As a result, technology is not always able to keep up. Staff does not want to hold our working partners in violation of our regulations when all feasible efforts are being made. The staff's proposal includes the following:

- Add a 2004–2006 engine exhaust emission standard of 1.8 g/bhp-hr NOx and 0.01 g/bhp-hr PM for diesel HEBs;
- Add emission reduction requirements to the fleet rule for transit agencies for the purchase of diesel HEBs;
- Modify the zero-emission bus demonstration project.

B. Staff Recommendation

ARB staff recommends the Board adopt the proposed modifications to sections 1956.1, 1956.2, 1956.3 and 1956.4, title 13, chapter 1, article 4, CCR, in its entirety. The regulation is set forth in the proposed regulation order in Appendix A.

XII. REFERENCES

ARB. December 10, 1999. Staff Report: Initial Statement of Reasons, Proposed Regulation for a Public Transit Bus Fleet Rule and Emission Standards for New Urban Buses. http://www.arb.ca.gov/regact/bus/bus.htm

ARB. June 30, 2000a. Neighborhood Assessment Program Work Plan. http://www.arb.ca.gov/ch/programs/nap/napworkplan.pdf

ARB. December 8, 2000b. Final Statement of Reasons for Rulemaking, including Summary of Comments and Agency Responses, Public Hearing to Consider Adoption of a Public Transit Bus Fleet Rule and Emission Standards for New Urban Buses. http://www.arb.ca.gov/regact/bus/bus.htm.

ARB. December 13, 2001. Policies and Actions for Environmental Justice. http://www.arb.ca.gov/ch/ejpolicies_121301.pdf

ARB. September 6, 2002. Initial Statement of Reasons: Public Hearing To Consider Amendments To The Public Transit Bus Fleet Rule And Emission Standards For New Urban Buses. http://www.arb.ca.gov/regact/bus02/bus02.htm

ARB. October 16, 2003. Final Statement of Reasons for Rulemaking, including Summary of Comments and Agency Responses, Public Hearing to Consider Adoption of a Public Transit Bus Fleet Rule and Emission Standards for New Urban Buses. http://www.arb.ca.gov/regact/bus02/bus02.htm.

U. S. EPA. January 19, 2001. Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements. Federal Register Volume 66, Number 12. Thursday, January 18, 2001.
http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfr86a_03.html

APPENDIX A

PROPOSED REGULATION ORDER

FINAL REGULATION ORDER

Amend the following sections of title 13, California Code of Regulations, to read as set forth in the following pages:

Section 1956.1	Exhaust Emission Standards and Test Procedures – 1985 and Subsequent Model Heavy Duty Urban Bus Engines and Vehicles.
Section 1956.2	Fleet Rule for Transit Agencies
Section 1956.3	Zero-Emission Bus Requirements
Section 1956.4	Reporting Requirements for all Urban Bus Transit Agencies

Notes:

a) Paragraphs within these sections that are not proposed for amendment in this rulemaking are indicated by "[No Change]".

b) The proposed regulatory amendments are shown in <u>underline</u> to indicate additions to the text and ~~strikeout~~ to indicate deletions.

Amend section 1956.1 to read as follows:

1956.1 Exhaust Emission Standards and Test Procedures - 1985 and Subsequent Model Heavy Duty Urban Bus Engines and Vehicles

(a) [No Change]

(1) [No Change]

(2) [No Change]

(3) [No Change]

(4) [No Change]

(5) [No Change]

(6) [No Change]

(7) [No Change]

(8) [No Change]

(9) [No Change]

(10) [No Change]

(11) 2004-2006 – For diesel-fueled, or dual-fuel, and bi-fuel urban bus engines except for heavy-duty pilot ignition engines, the standards are 0.5 g/bhp-hr NOx, 0.01 g/bhp-hr PM, 0.05 g/bhp-hr NMHC, 5.0 g/bhp-hr CO, and 0.01 g/bhp-hr formaldehyde. As an option, manufacturers may choose to meet the NOx and PM standards with a base engine that is certified to the standards in paragraph (10) above, equipped with an aftertreatment system that reduces NOx to 0.5 g/bhp-hr and PM to 0.01 g/bhp-hr standards. The NMHC, CO, and formaldehyde standards in this paragraph (11) shall still apply. Manufacturers shall be responsible for full certification, durability, testing, and warranty and other requirements for the base engine. For the aftertreatment system, manufacturers shall not be subject to the certification durability requirements, or in-use recall and enforcement provisions, but are subject to warranty provisions for functionality.

(A) ~~In addition, e~~Engine manufacturers may sell diesel-fueled, dual-fuel, or bi-fuel engines to any transit fleet exempted by the Executive Officer under paragraphs (c)(8) and (d)(7) of section 1956.2, Title 13, CCR, from the requirements of

paragraphs (c)(5) and (d)(4) of section 1956.2, certified to the standards in either paragraphs (9) or (10) above, provided that engines certified to the standards in paragraph (10) must be certified to a 0.01 g/bhp-hr PM standard.

(B) Manufacturers may sell diesel-fueled hybrid-electric buses that are certified to a 1.8 g/bhp-hr NOx and 0.01 g/bhp-hr PM standard to any transit agency that has received written authorization from the Executive Officer pursuant to paragraph (d)(9) of section 1956.2, title 13, CCR.

(12) 2007 and subsequent – 0.2 g/bhp-hr NOx, 0.01 g/bhp-hr PM, 0.05 g/bhp-hr NMHC, 5.0 g/bhp-hr CO, and 0.01 g/bhp-hr formaldehyde.

(b) [No Change]

(c) The test procedures for determining compliance with standards applicable to 1985 and subsequent heavy-duty diesel cycle urban bus engines and vehicles and the requirements for participation in the averaging, banking and trading programs, are set forth in the "California Exhaust Emission Standards and Test Procedures for ~~1985~~ 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," adopted December 12, 2002 ~~April 8, 1985, as last amended November 22, 2000~~, and the "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes", adopted October 24, 2002, which are incorporated by reference herein.

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018, 43100, 43101, 43104, and 43806, Health and Safety Code, and section 28114, Vehicle Code
Reference: Sections 39002, 39003, 39017, 39033, 39500, 39650, 39657, 39667, 39701, 40000, 43000, 43000.5, 43009, 43013, 43018, 43102, and 43806, Health and Safety Code, and section 28114, Vehicle Code.

SECTION 1956.2, TITLE 13, CCR

1956.2 *Fleet Rule for Transit Agencies*

(a) [No Change]

(b) For purposes of the fleet rule specified in this section, the following definitions apply:

(1) [No Change]

(2) [No Change]

(3) [No Change]

(4) [No Change]

(5) "Hybrid-electric bus" means an urban bus equipped with at least two sources of energy on board; this energy is converted to motive power using electric drive motors and an auxiliary power unit, which converts consumable fuel energy into mechanical or electrical energy. The electric drive motors must be used partially or fully to drive the vehicle's wheels.

~~(5)~~(6) [No Change]

~~(6)~~(7) [No Change]

~~(7)~~(8) [No Change]

(c) [No Change]

(d) Transit agencies on the diesel path shall meet the following requirements:

(1) [No Change]
(2) [No Change]
(3) Zero-emission bus demonstration ~~in 2003-2004,~~as required in subdivision (b) of section 1956.3, title 13, CCR.
(4) [No Change]
(5) [No Change]
(6) [No Change]
(7) [No Change]
(8) [No Change]

(9) The Executive Officer shall authorize, in writing, a transit agency on the diesel path to purchase one or more diesel-fueled hybrid-electric bus certified under title 13, CCR, section 1956.1 (a)(11)(B) provided that:

(A) The transit agency shall submit a mitigation plan and letter requesting approval by January 1, 2005, to the Executive Officer that demonstrates that the transit agency will provide surplus emission reductions from urban buses in its fleet that will offset the NOx emission difference between the certified NOx emission standard of the hybrid-electric bus and 0.5 g/bhp-hr. The transit agency may not use NOx emission reductions that are otherwise required by any statute, regulation, or order or the emission reductions that will accrue from the retirement of an urban bus to be replaced by a hybrid-electric bus for the offset;

(B) The transit agency shall complete implementation of all mitigation measures set forth in the approved plan to offset NOx emissions prior to the receipt of the last diesel-fueled hybrid-electric bus; and

(C) The transit agency shall submit the reports required by section 1956.4 (h).

(e) [No Change]

(f) [No Change]

(g) [No Change]

NOTE: Authority cited: Sections 39600, 39601, 39667, 43013, 43018, and 43701(b), Health and Safety Code. Reference: Sections 39002, 39003, 39017, 39500, 39650, 39667, 40000, 43000, 43000.5, 43013, 43018, 43701(b), 43801, and 43806, Health and Safety Code, and sections 233 and 28114, Vehicle Code.

SECTION 1956.3, TITLE 13, CCR

1956.3 Zero-emission Bus Requirements

(a) [No Change]

(b) Zero-emission Bus Demonstration Project – except as provided in (3) below, the owner or operator of an urban bus fleet on the diesel path in accordance with the provisions of section 1956.2, with more than 200 urban transit buses in its active fleet on January 31, 2001, shall implement a demonstration project. The owner or operator shall evaluate the operation of zero-emission buses in revenue service, and prepare and submit a report on the demonstration project to the Executive Officer for inclusion in a future review of zero-emission technology.

(1) [No Change]

(2) When planning and implementing the demonstration project, the operator or owner shall meet the following milestones:

(A) [No Change]
(B) no later than ~~July 1, 2003~~ February 28, 2006, place at least three zero-emission buses in ~~revenue service~~operation, and
(C) no later than July 31, 2005, submit a preliminary report on the demonstration project to the Executive Officer, in accordance with paragraph (e)(3) of section 1956.3, title 13, CCR and,
~~(C)~~D no later than ~~January 31, 2005~~July 31, 2007, submit a report on the demonstration project to the Executive Officer, in accordance with paragraph (e)(3) of section 1956.4, title 13, CCR.

(3) Multiple transit agencies within the same air basin may, on a case-by-case basis, petition the Executive Officer to implement a joint zero-emission bus demonstration project. Electric trolley buses shall not qualify as zero-emission buses for purposes of this joint demonstration project. No more than three transit agencies can participate in any one joint project. Transit agencies that are participating in a joint demonstration project shall:

(A) designate the agency hosting the onsite demonstration,
(B) jointly fund the demonstration project, and
(C) place a minimum of three zero-emission buses per ~~participating transit agency~~demonstration project in revenue service.

(c) [No Change]

(d) [No Change]

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018, 43100, 43101, 43104, and 43806, Health and Safety Code. Reference: Sections 39002, 39003, 39017, 39018, 39500, 39701, 40000, 43000, 43000.5, 43009, 43013, 43018, 43102, 43801, and 43806, Health and Safety Code, and section 28114 Vehicle Code.

SECTION 1956.4, TITLE 13, CCR

1956.4 Reporting Requirements for all Urban Bus Transit Agencies

(a) [No Change]

(b) [No Change]

(c) [No Change]

(d) [No Change]

(e) The following reports on the zero-emission bus demonstration program shall be submitted by those transit agencies required to conduct such demonstrations, as described below:

(1) [No Change]

(2) [No Change]

(3) A preliminary report shall be submitted by July 31, 2005 and contain, at a minimum, the following information:

(A) a brief description of the zero-emission technology utilized, identification of the bus manufacturer, and the product specifications;

(B) miles driven per bus in revenue and non-revenue service, safety incidents, and maintenance (both scheduled and unscheduled);

(C) qualitative transit personnel and passenger experience; and

(D) a financial summary of the capital costs of bus purchases and/or leases and fueling infrastructure.

~~(3)~~(4) A final report shall be submitted by ~~January 31,2005~~July 31, 2007, and contain, at a minimum, the following information:

(A) a brief description of the zero-emission technology utilized, identification of bus manufacturer and product specifications,

(B) miles driven per bus in revenue service, bus down time (scheduled and unscheduled), safety incidents, driver and

mechanic training conducted, and maintenance (both scheduled and unscheduled),

(C) qualitative transit personnel and passenger experience, and

(D) a financial summary of capital costs of demonstration program, including bus purchases and/or leases, fueling infrastructure, any new facilities or modifications, and annual operating costs.

(f) [No Change]

(g) [No Change]

(h) A transit agency requesting approval for the purchase of diesel-fueled hybrid-electric buses pursuant to paragraph (d)(9), section 1956.2, title 13, CCR, shall:

(1) submit an application for approval that meets the requirements of paragraphs (d)(9)(A) and (d)(9)(B), section 1956.2, title 13, CCR;

(2) include in the application all of the following: the number, manufacturer, make and model year of diesel-fueled hybrid-electric buses to be purchased; the schedule for the purchase and delivery of the buses; a detailed description of all measures that will be used to offset the excess NOx emissions including identification of the specific buses to which the measures will be applied, and the schedule for implementing those measures; and

(3) submit a final report to the Executive Officer within 30 days of receipt of the last diesel-fueled hybrid-electric bus that documents the schedule of delivery of the diesel-fueled hybrid-electric buses, timing, and completion of all measures to achieve the NOx offset.

NOTE: Authority cited: Sections 39600, 39601, 39659, 39667, 39701, 43018, and 41511, Health and Safety Code. Reference: Sections 39667, 39700, 39701, 41510, 41511, 43000, 43000.5, 43013, 43018, 43801, and 43806, Health and Safety Code.