

State of California
AIR RESOURCES BOARD

Final Statement of Reasons for Rulemaking,
Including Summary of Comments and Agency Response

PUBLIC HEARING TO CONSIDER THE ADOPTION OF THE PROPOSED
Modifications to the Exhaust Emission Standards and Test Procedures - 1985 and
Subsequent Model Heavy-Duty Urban Bus Engines and Vehicles, the Fleet Rule for Transit
Agencies, and the Zero-Emission Bus (ZEB) Demonstration Project

Public Hearing Date: June 24, 2004
Agenda Item No.: 04-6-4

I. INTRODUCTION

On May 7, 2004 the Air Resource Board (ARB or the Board) published a Notice of Public Hearing that described the proposed modifications to the regulations described therein and invited public comment on the proposal. The Staff Report: Initial Statement of Reasons for Rulemaking ("Staff Report"), titled "Proposed Modifications to the Exhaust Emission Standards and Test Procedures - 1985 and Subsequent Model Heavy-Duty Urban Bus Engines and Vehicles, the Fleet Rule for Transit Agencies, and the Zero-Emission Bus Demonstration Project," was released on May 7, 2004. This document included an ~~underline/strikeout~~ version of the regulatory text and was made available to the public upon request as required by Government Code §11346.2, and is incorporated by reference herein.

At the public hearing held on June 24, 2004, the Board considered the proposed regulations and received written or oral comments on the regulatory proposal. At the conclusion of the hearing, the Board adopted the regulation as initially proposed by staff without further modifications.

Background. At the public hearing 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 manufacturers of new urban bus engines and vehicles. The multi-faceted regulations were designed to reduce oxides of nitrogen, or NOx, an ozone precursor, and particulate matter, or 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 project and ZEB acquisition requirements applicable to larger transit agencies.

Hybrid-Electric Buses

On January 1, 2004, the California diesel urban bus engine exhaust emission standard dropped to 0.5 grams per brake horsepower-hour (g/bhp-hr) NOx and no diesel engine manufacturer has certified or plans to certify an engine to this engine standard. Thus, no diesel hybrid-electric system manufacturer can certify its product for California and no transit agency can purchase new diesel buses to replace older buses or augment its fleet. Hybrid-

electric buses (HEB) are technologically able to achieve lower emissions and better fuel economy than an equivalently-sized diesel bus. Since ARB's adoption of the interim certification procedure for hybrid-electric vehicles in the urban bus and heavy-duty vehicle classes in October 2002, only one 2004 model year HEB, which is gasoline-fueled, has been California-certified for sale and purchase.

With only a single gasoline HEB certified for purchase in California, the transit agencies on the diesel path cannot purchase new buses without converting to alternative fuels. Most of the transit agencies on the diesel path are limited by a lack of infrastructure and are not able to purchase alternative fuel buses without investing in a fueling station. In an effort to promote the turnover of the oldest, dirtiest diesel engines with newer, cleaner buses, the Board agreed that transit agencies on the diesel path should be provided with the cleanest, most aggressive diesel choice available, which currently is diesel HEB technology.

The current diesel HEBs do not meet the 0.5 g/bhp-hr NO_x standard; therefore, they are prohibited for sale in California. A standard for diesel HEBs for the 2004-2006 MYs is needed to bring innovative technology, at the lowest technically feasible emission standard, to California's marketplace. From 2004 through 2006 transit agencies on the diesel path will be allowed to purchase diesel HEBs certified to 1.8 g/bhp-hr NO_x, provided they offset the difference between 1.8 g/bhp-hr NO_x and the current diesel urban bus engine standard of 0.5 g/bhp-hr NO_x. Offsets can be obtained through installing a retrofit device that reduces NO_x emissions or repowering to a lower emitting diesel or alternative-fuel engine. Thus, the Board maintains a fuel neutral position while requiring that all transit agencies, regardless of fuel path, comply with the 0.5 g/bhp-hr NO_x standard.

Zero-Emission Bus Demonstration

In the original rulemaking imposing the zero-emission bus (ZEB) requirements, the Board anticipated that fuel cells would be developed and deployed in transit buses initially; however, light duty vehicle applications have been the focus of fuel cell providers, resulting in heavy-duty fuel cells that are both more expensive and behind schedule. Transit agencies have been diligent in attempting to comply with the original fuel cell bus demonstration project requirements and timetable; however, the projects are behind schedule, and the transit agencies will not have the number of concurrent, in-use fuel cell buses in revenue service in time to meet the regulatory deadline. In order to reflect the cost and expected availability of the advanced technology required for the delivery of fuel-cell buses, a revised start date and a reduction in the number of buses required for the ZEB demonstration project are needed.

A complete description of the proposed modifications and their rationale is contained in the Staff Report. This document and the May 7, 2004, Notice are incorporated herein by reference. This Final Statement of Reasons summarizes the Staff Report by identifying and explaining the regulatory amendments. This Final Statement of Reasons also contains a summary of the comments the Board received on the proposed modifications during the formal rulemaking process and ARB's responses to those comments.

The proposed modifications will appear in title 13, California Code of Regulations (CCR), sections 1956.1, 1956.2, 1956.3, and 1956.4.

Economic And Fiscal Impacts. In developing the proposed modifications, ARB staff evaluated the potential economic impacts on private persons and businesses. The Board has determined that the proposed modifications would not impose any costs on government-contracted (publicly-contracted) and government (publicly-owned) transit agencies. Furthermore, 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. Staff does not expect any negative impacts from this proposal.

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 in the Staff Report, these proposed amendments provide transit agencies with the option to purchase diesel HEBs in 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 for compliance, thus spreading out the cost over a longer time period.

Consideration Of Alternatives. For reasons set forth in the Staff Report, in staff's comments and responses at the hearing, and in this Final Statement of Reasons, the Board has determined that no alternative considered by the agency, or that has otherwise been identified and brought to the attention of the agency, would be more effective in carrying out the purposes for which the regulatory action was proposed or would be as effective and less burdensome to affected private persons than the action taken by the Board.

Non-Substantial Changes. Staff made changes to the final regulation order to correct clerical errors deemed non-substantial. The changes are described below:

1956.3 (b) (2) (C): the referenced section should be 1956.4, not 1956.3

1956.3 (b) (2) (D): the referenced section should be (e)(4), not (e)(3)

1956.2 (d) (9) (A): deadline is by January 31, not January 1

II. SUMMARY OF PUBLIC COMMENTS AND AGENCY RESPONSES

At the June 24, 2004, hearing, oral testimony was received from:

Joshua Shaw, California Transit Association (Cal Transit)*

Jose Cisneros, San Francisco MUNI (MUNI)

Gene Walker, California Transit Association (Cal Transit)* and Golden Gate Bridge Highway & Transportation District (GGT)*

David Olmeda, San Mateo County Transit District (Samtrans)

Robert F. Babik, General Motors (GM)*

Thomas Webb, BAE Systems (BAE)*

Doug Quetin, California Air Pollution Control Officers Association (CAPCOA)

Barry Wallerstein, South Coast Air Quality Management District (SCAQMD)*

Chung Liu, South Coast Air Quality Management District (SCAQMD)

Michael Eaves, California Natural Gas Vehicle Coalition (CNGVC)*

Julie Masters, Natural Resources Defense Council (NRDC)

Michael C. Simon, ISE Corp (ISE)*

Dawn Friest, Engine Manufacturer's Association (EMA)*

Nidia Bautista, Coalition for Clean Air (CCA)

Marty Meller, San Francisco MUNI (MUNI)

The people listed above with asterisks also submitted written comments. In addition, written comments were received by the hearing date from the following persons:

Paul Scott, ISE Corp (ISE)

Andrew J. Littlefair, Clean Energy

Steve Heminger, Metropolitan Transportation Commission (MTC)
 Jeffrey Noonan-Day, John Deere (Deere)
 Gavin Newsom, City & County of San Francisco (SF)
 Gabriel Metcalf, San Francisco Planning and Urban Research Association (SPUR)
 Jared Blumenfeld, San Francisco Department of the Environment (SF Environment)
 Michael Burns, Municipal Transportation Agency, San Francisco (SF MTA)
 Andrew Sullivan, Rescue MUNI
 Tom K. Koutsoulis, private citizen
 Jack P. Broadbent, Bay Area Air Quality Management District (BAAQMD)
 Larry Greene, California Air Pollution Control Officers Association (CAPCOA)
 Peter M. Cipolla, Santa Clara Valley Transportation Authority (VTA)
 Gary B. Heston, Long Beach Transit (LBT)
 Chris Ferrara, Chuck Hammond, Rick Ruvolo, Bay Area Regional Clean Cities Coalition (BARCCC)
 William Craycraft, California Natural Gas Vehicle Partnership (CNGVP)
 Daniel Murphy, Municipal Transportation Agency, Citizen's Advisory Council, San Francisco (MTA CAC SF)
 Diane Bailey, Natural Resources Defense Council (Enviro Coalition)
 Bonnie Holmes-Gen, American Lung Association of California (Enviro Coalition)
 Todd Campbell, Coalition for Clean Air (Enviro Coalition)
 Joseph K. Lyou, California Environmental Rights Alliance (Enviro Coalition)
 Don Anair, Union of Concerned Scientists (Enviro Coalition)
 V. John White, Sierra Club California (Enviro Coalition)
 Kathryn Phillips, Center for Energy Efficiency and Renewable Technologies (Enviro Coalition)
 Meena Palaniappan, Pacific Institute for Studies in Development, Environment, and Security (Enviro Coalition)
 Jesse N. Marquez, Coalition for a Safe Environment (Enviro Coalition)
 Tiffany Schauer, Our Children's Earth (Enviro Coalition)
 Martha Dina Arguello, Physician's for Social Responsibility-Los Angeles (Enviro Coalition)

Set forth below is a summary of each comment, objection, or recommendation made regarding the specific regulatory action proposed, together with the ARB response to each objection or recommendation, and the reasons for making no change. The comments have been grouped by topic wherever possible. Comments not involving objections or recommendations specifically directed towards the rulemaking or to the procedures followed by ARB in this rulemaking are not summarized below, although some non-responsive comments are summarized and discussed.

SUPPORT

1. **Comment** (MTC, SF, Cal Transit, SPUR, SF Environment, MTA SF, Rescue MUNI, GGT, Koutsoulis, GM, BAAQMD, VTA, MTA CAC SF, BAE, MUNI, Samtrans, CCA): Staff received several comments in support of the proposed amendments (some made supporting comments relating to specific amendments; others offered general support).

Agency Response: Staff appreciates these comments and looks forward to continuing to work with industry and environmental leaders to promote the overall improvement of air quality in the state of California.

HYBRID-ELECTRIC BUS (HEB) AMENDMENTS

2. **Comment** (Clean Energy): Staff is proposing to use a 0.75 multiplier to reduce emissions of the diesel hybrid electric bus from 2.5 g/bhp-hr to 1.8 g/bhp-hr. "I do not

recall any public hearings to debate the validity of this factor." "I strongly urge . . . the Board members to ask for staff to both clarify and justify this methodology."

Agency Response: The diesel hybrid-electric urban bus emission standard is based on staff's comprehensive assessment of hybrid-electric technology and emissions test data, and is not based on applying a multiplier to an existing emission standard. Staff concluded that an exhaust emission standard of 1.8 g/bhp-hr NO_x and 0.01 g/bhp-hr PM is feasible for state of the art diesel hybrid-electric drive systems. In fact, a 0.75 multiplier applied to 2.5 g/bhp-hr results in 1.875 g/bhp-hr, which is greater than the diesel hybrid-electric urban bus NO_x standard of 1.8 g/bhp-hr.

3. **Comment** (Clean Energy): Diesel HEBs have an incremental cost over traditional diesel buses of \$140,000 to \$150,000 per bus, plus the requirement to repower or retrofit will add \$40,000 to the total cost per bus. If cost is a consideration in rule making decisions, how can the staff's proposed modification be justified?

Agency Response: This amendment provides transit agencies on the diesel path with an additional option when making decisions about bus purchases but does not mandate any transit agency to purchase a diesel HEB. A voluntary provision, such as this one, does not impose additional costs on transit agencies.

4. **Comment** (SCAQMD): Retain the 2004-2006 MY emissions standard of 0.5 g/bhp-hr NO_x for diesel path properties, along with all provisions of the existing Transit [Agency] Fleet Rule. Hybrid gasoline buses should be considered the benchmark for interim rule compliance, since they have been certified at less than the 0.5 gram NO_x level.

Agency Response: The Board acknowledges the recent advance in gasoline hybrid bus engine technology, including lower emissions and better fuel economy, but this technology is in the early stages of commercialization and does not yet have proven durability and reliability. The advances are very promising; however, there is still more work to be done. The Board recognizes the various applications in the field and supports all levels of technological advancement in order to best serve the public while promoting air quality. Gasoline hybrid-electric buses are the current benchmark technology available for those transit agencies on the alternative fuel path. Many transit agencies on the diesel path, however, are limited by the lack of fueling infrastructure and are therefore not able to purchase alternative fuel buses.

Diesel HEB technology offers transit agencies on the diesel path an alternative that allows them to maintain a single fuel and maintenance program geared towards diesel engines, while at the same time offering them a bus with lower emissions and better fuel economy than a conventional diesel bus. Retaining the 0.5 g/bhp-hr NO_x emission standard for the 2004 – 2006 MY would continue to prevent the sale of diesel HEBs in California during a time period when there very few urban buses, diesel- or alternative-fueled, for sale. Preventing replacement of the oldest diesel buses with cleaner-emitting urban buses for this three-year period would result in higher net. Therefore, to promote innovative technological advances, the Board approved a 1.8 g/bhp-hr NO_x standard for diesel HEBs, but included an offset requirement to ensure that all transit agencies, regardless of fuel path, comply with the 0.5 g/bhp-hr NO_x standard. By doing so, the Board maintains a fuel neutral position while promoting innovative technology to improve air quality.

5. **Comment** (SCAQMD, CAPCOA): The Board should require that manufacturers pull forward [to require in 2004] the use of diesel engines certified to 1.2 g NO_x/bhp-hr or less for the HEBs.

Agency Response: Staff solicited comments from diesel engine manufacturers during the informal workshop process and no manufacturer stated that it could or would bring a 1.2 g NOx/bhp-hr engine into California prior to 2007. California represents a small portion of the overall urban bus market share and therefore cannot compel engine manufacturers to meet this stricter standard. The commenters' proposal therefore would have no effect on the availability of diesel engines certified in California for urban buses.

6. **Comment** (SCAQMD): The existing 0.4 g NOx gasoline hybrid bus certification should be considered by CARB to represent full compliance with the interim urban bus emission standard of 0.5 grams NOx.

Agency Response: Staff agrees and the Board has defined gasoline, when used in a HEB, as an alternative fuel. Thus any transit agency is able to purchase a gasoline HEB, including those on the alternative-fuel path.

7. **Comment** (BAAQMD): CARB should require that the proposed mitigation plan for transit districts purchasing diesel-electric hybrid buses offset the emissions difference between the proposed 1.8 g/bhp-hr standard and the 2007 emission standard of 0.2 g/bhp-hr.

Agency Response: This would require a much more stringent standard beyond the proposed regulation. The additional costs associated with a more stringent standard could hinder the replacement of dirtier buses; thus, result in higher emissions because older, higher emitting diesel buses would not be replaced with newer, cleaner diesel buses. Staff's assessment of the proposed regulation found the standard to be technologically and economically feasible, given the current available technology, while providing emissions benefits by introducing new and cleaner technology to the state.

8. **Comment** (CAPCOA): The proposed changes are unjustified in light of the need to achieve maximum emission control effectiveness from this source category and the availability of gasoline HEB technology. Between 2004-2006, transit agencies on the diesel path should be encouraged to purchase gasoline hybrid buses or diesel buses certified to 1.2 g NOx/bhp-hr.

Agency Response: The Staff Report (pages 13 - 18) details the justification for the proposed regulation. Transit agencies on the alternative-fuel path are able to purchase gasoline hybrid buses; however, there are no diesel buses certified to 1.2 g/bhp-hr NOx. Therefore, to maintain integrity of the dual-fuel path regulation as adopted by the Board in 2000, and to encourage the turnover the dirtiest diesel buses, staff believes that transit agencies on the diesel path should be provided with the most aggressive diesel choice available, which currently is diesel HEB technology.

9. **Comment** (LBT): The proposed restriction that NOx offsets be surplus to emission reductions accruing from the retirement of a diesel bus replaced by an HEB is overly restrictive and should be removed so that emission reductions gained by retiring a diesel bus and replacing it with a diesel HEB would count as an offset. ARB should allow both types of certified HEBs (diesel and gasoline) without requiring the offset to be made solely with NOx emission control devices.

Agency Response: The Board is requiring that NOx offsets be surplus to emission reductions accruing from the retirement of a replaced diesel bus to ensure that the NOx offsets are greater than those achieved by a simple replacement program. This regulation offers NOx reduction offsets for either installing aftertreatment technology or repowering an older bus because neither are required purchases under the fleet rule for

transit agencies. These emission savings would be surplus to other requirements and thus available to offset any NOx increases from the purchase of diesel HEBs. Staff is proposing the need for NOx reduction offsets 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.

10. **Comment (CNGVC):** The emission [standard] target for diesel HEBs seems to be a technical modification of the rule that is a circumvention of CARB standards and a major concession to engine manufacturers.

Agency Response: Staff disagrees with the comment that these emission standards circumvent the current diesel engine standards. The Notice of Public Hearing clearly described the amendment to the standards to accommodate HEBs, so ARB standards are not being “circumvented”. Staff’s assessment, described in detail in the Staff Report, provides the rationale for the Board’s decision to approve the proposed regulation. The Board is committed to bringing innovative technology at the lowest technically feasible emission standard and cost-effectiveness. To achieve this goal, staff assessed available technology and emission data and determined the necessary standards to promote air quality and state-of-the-art technology.

11. **Comment (ISE):** Raising the current NOx emissions standard to a higher level as proposed would open up California's market to diesel hybrid systems produced outside our state, but none of these is any more proven than ISE's [gasoline] hybrid system.

Agency Response: The diesel HEB option is only being made available to transit agencies on the diesel path. Diesel path transit agencies can purchase a gasoline HEB without having to provide offsets, which may serve as an incentive to purchase these buses instead of a diesel HEB. The transit agencies on the alternative-fuel path will not be able to purchase any diesel HEBs, thus preserving ISE's ability to sell its gasoline HEBs to approximately 40 percent of the transit agencies on the alternative-fuel path plus those diesel path agencies operating in the South Coast AQMD, most of which are prohibited from purchasing diesel urban buses.

12. **Comment (Enviro Coalition):** We do not take a position on the diesel hybrid-electric proposal so long as it includes NOx offset requirements.

Agency Response: Staff thanks the commenters and appreciates their input.

13. **Comment (NRDC):** We strongly support advancement of hybrid technology but ARB should require the purchase of the cleanest hybrid rather than allowing the dirtier diesel hybrids into the rule.

Agency Response: Under the commenter's proposal, only the manufacturer that "wins" (i.e., has the cleanest engine), after a long and very costly research and development program, could sell its engine in California. Such a regulation that restricts purchases to the "cleanest" hybrid available would hinder technology research and development. This would also remove competition from the marketplace and could therefore result in increased costs to transit agencies as the "winner" would have no competition to reduce costs. The current regulation-setting system of establishing a standard and allowing all manufacturers to meet or even beat the standard has been very successful in encouraging technological advancement, competition, and emission reductions.

While they do have higher emissions than the gasoline HEB, ARB is allowing diesel HEBs to enter the California market to encourage development of this technology and

allow transit agencies on the diesel path to replace their oldest, dirtiest diesel buses with cleaner HEBs. One type of bus does not fit all situations in all transit agencies and thus ARB is providing transit agencies with more than one type of HEB. A transit agency that purchases a diesel HEB will still have to reduce its NOx emissions to as low as if the transit agency had purchased the cleaner gasoline HEB.

ZERO EMISSION BUS (ZEB) AMENDMENTS

14. **Comment** (ISE): The proposed modification to the ZEB rule should reflect advances in hydrogen internal combustion engine and hybrid hydrogen drive-trains, and the possible attainment of ZEB goals by use of larger numbers of less expensive hydrogen hybrid internal combustion engines (HHICE). Staff's analysis should include the HHICE option as an acceptable alternative to the fuel cell path to ZEB goals.

Agency Response: The changes to the ZEB regulation, proposed by staff at the June Board hearing, were limited to the ZEB demonstration project. Staff has been monitoring the progress of the ZEB demonstration and determined that despite due diligence by the transit agencies they would not be able to comply with the regulation. While transit agencies did request a review of the compliance target dates in the regulation, they did not request a change of the technology eligible for the ZEB demonstration. The transit agencies subject to the ZEB demonstration project have initiated development of fuel cell based ZEB demonstrations and have entered into contracts for fuel cell powered buses. In addition, a limited technology review did not suggest that changing the type of technology used in the ZEB demonstrations was needed at this time.

In addition, a ZEB is defined, in section 1956.3, as producing zero exhaust emissions of any criteria pollutant (or precursor pollutant) under any and all possible operational modes and conditions. While HHICE have the potential of being very low emitting, they do not meet the criteria of this definition.

15. **Comments** (ISE): Appropriate credit should be allowed to fuel suppliers and transit properties that choose low-carbon or zero carbon sustainable fuel path choices.

Agency Response: The carbon content of fuel or fuel specifications is not directly regulated through the transit bus regulations. However, the transit bus regulations provide incentives to transit agencies choosing to use alternative or low-carbon fuels. Transit agencies using alternative fuels were given additional time to comply with particulate matter retrofit requirements and may purchase new alternatively fueled engines with relatively higher oxides of nitrogen emission through model year 2006.

16. **Comment** (Cal Transit, GGT): The current test and reporting dates for the ZEB [demonstration] program have not been addressed; while staff has recognized the delay in the demonstration project, the reporting dates have not been changed to reflect those delays.

Agency Response: The proposed regulations modify the start and reporting dates of the ZEB demonstration project to allow the participating transit agencies to attain compliance. The regulation was modified to require that the buses be deployed by February 28, 2006, and the final project report is due to the ARB July 31, 2007.

17. **Comment** (LBT): ARB should amend the ZEB purchase requirement timeline and extend the deadline by which transit agencies on the diesel path must replace 15 percent of their fleet from 2008 to 2010.

Agency Response: ARB staff will be researching and presenting a zero-emission bus technology review that will include an assessment on the feasibility of implementing the ZEB purchase requirements to the Board in early 2006. The 2006 date will allow ARB to include information from the current ZEB demonstration projects in the review and still allow time for transit agencies to develop purchase plans.

HARMONIZATION WITH 2007 EPA STANDARDS

18. **Comment** (Cal Transit, EMA, GGT, MTC, Samtrans): ARB should align urban bus engine standard with the 2007 federal heavy-duty on-highway engine requirements.

Comment (Enviro Coalition, CCA, NRDC): ARB should **not** align urban bus engine standards with the 2007 federal heavy-duty on-highway engine requirements.

Agency Response: The 2007 exhaust emission standards for urban bus engines were not the focus of these proposed modifications; therefore, these comments are non-responsive to the proposal set forth in the hearing notice. However, the Board will consider this issue in 2005.

FUEL PATH

19. **Comment** (Clean Energy, CNGVC, CNGVP): ARB should eliminate the diesel fuel path in favor of the alternative fuel path.

Comment (CNGVC): On the basis of economics, natural gas buses are far and away the best choice over diesel or gasoline hybrid electric buses.

Comment (BARCCC): CARB should not compromise the rule for non-compliant diesel engines to be sold in California; diesel path transit agencies should begin using natural gas buses

Agency Response: Amending the choice of fuel path was not the focus of this proposed regulation; therefore, these comments are non-responsive. It is important to note, however, that the dual-path system was established to provide flexibility to transit agencies in choosing diesel or alternative-fueled buses while ensuring maximum emission benefits by encouraging a turnover of the oldest, dirtiest diesel engines.

EMISSION BENEFITS

20. **Comment** (CNGVC): Modeling will show under certain circumstances there are insufficient emission offsets to be gained by retrofitting a fleet with aftermarket NOx control systems to allow a six-year purchase of diesel hybrid buses. And while offsets lower the near term fleet NOx average, in the out years (2014-2025), [NOx] fleet averages will be higher than where fleets would be had CARB compliant engines been purchased as specified under the rule. If you take a look at the modeling, it takes more than a one-to-one offset to make the system whole.

Agency Response: Staff conducted a comprehensive assessment of the emission data and believes its assumptions used in establishing the standards accurately reflect the emission benefits gained from the adoption of the proposed regulations. Further, the commenter did not provide staff with its modeling or analysis and so we cannot evaluate the commenter's claims. Staff is requiring that each transit agency incorporate the expected life of the NOx reduction system in developing its offset program to ensure that

the offsets last for the twelve year life of an urban bus. ARB's modeling did not show that more than a one-to-one offset is required to make the system whole.

REQUESTS FOR FURTHER NOX REDUCTION

21. **Comment** (SCAQMD): CARB's proposal allows those transit agencies on the diesel path to demonstrate equivalency to a 0.5 g/bhp-hr NOx standard by requiring retrofit requirements of the existing diesel transit bus fleet. The South Coast AQMD staff urges CARB to consider amendments to this regulation to require retrofit requirements which achieve additional NOx reductions from existing transit bus fleets.

Comment (BAAQMD): CARB should also adopt a lower fleet-wide NOx average for all transit fleets to accelerate fleet turnover, installation of after-treatment technology, and repowering with certified cleaner engines.

Comment (CAPCOA): Transit agencies should be required to retrofit all diesel buses with NOx controls to achieve at least a 25 percent reduction from baseline such that the fleet average NOx is reduced to 3.6 g/bhp-hr.

Agency Response: These proposals are beyond the scope of the rulemaking notice and thus are non-responsive to the proposal. Nevertheless, staff will provide an analysis of NOx fleet averages in California transit agencies and the state of NOx aftertreatment technology in a future report to the Board. Staff does know that fleet-wide NOx emission from transit agencies have been dropping since the NOx fleet average of 4.8 g/bhp-hr was mandated by the Board on Oct 1, 2002, at the same time that transit agencies have been reducing their fleet PM emissions.

OTHER COMMENTS

22. **Comment** (ISE): "Well-to-wheels" and health and air quality cost benefit analyses should be rigorously applied to all public transportation entities, such that the basis for total cost is used in governmental analyses.

Agency Response: ARB's methodology for calculating the cost effectiveness of a proposed regulation, or amendments to an existing regulation, includes costs associated with compliance and the value of avoided deaths as a result of emission reductions. As such, health benefits are incorporated into the analysis. In addition, no project that may have a significant adverse environmental impact may be adopted as originally proposed if feasible alternatives or mitigation measures are available to reduce or eliminate such impacts. The Board has considered the impact of this proposed regulatory action on the economy of the state and a detailed cost benefit analysis is provided in the Staff Report. While a "well-to-wheels" cost analysis, which incorporates all of the costs (and benefits) from the extraction of the oil or gas through to the development and building of the bus, could be a useful additional analysis to consider, this analysis is very difficult and time-consuming to conduct, has many uncertainties because the data are often proprietary or otherwise unavailable, and has not been widely applied or accepted in determining costs and benefits from regulatory programs.

23. **Comment** (Deere): Incentive funding for the purchase of natural gas school, transit, and refuse truck fleet operators needs to continue to support the sale of low-emissions engines.

Agency Response: This comment is non-responsive to staff's proposal. Incentive funding is more properly addressed through the Carl Moyer Program and comments should be addressed to Carl Moyer Program staff.

24. **Comment** (BAAQMD): We encourage CARB to expedite as reasonably as practical its review and certification of biodiesel as a valid emission control strategy.

Agency Response: The verification of biodiesel as a diesel emission control strategy is not within the scope of the proposed regulation; therefore, this comment is non-responsive. However, it is important to note that use by a transit agency of any biodiesel fuel that meets the requirements of title 13, CCR, section 1956.2 (f)(6) is permitted at this time. In other words, the fuel must have less than 15 parts per million sulfur content and otherwise meet the requirements of a diesel fuel in California. The conflict with the use of biodiesel in an urban bus, or in any engine, arises in two situations: the engine manufacturer may void the engine warranty if it does not recognize biodiesel as an acceptable fuel and use of biodiesel may invalidate the verified diesel particulate matter reductions of an installed diesel emission control strategy, such as a diesel particulate filter. Currently, no diesel particulate filter is verified for use with biodiesel fuel, although that could change in the future.