

State of California  
AIR RESOURCES BOARD

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

PUBLIC HEARING TO CONSIDER AMENDMENTS TO THE PUBLIC TRANSIT BUS  
FLEET RULE AND EMISSION STANDARDS FOR NEW URBAN BUSES

Public Hearing Date: October 24, 2002  
Agenda Item No.: 02-8-2

**I. GENERAL**

**Introduction and Background**

In this rulemaking, the Air Resources Board (ARB or Board) is adopting amendments to the Public Transit Bus Fleet Rule and adopting interim certification procedures for hybrid-electric vehicles in the urban bus and heavy-duty vehicle classes. The Public Transit Bus Fleet Rule amendments include the following primary elements:

Modifying the current model year-based and particulate matter (PM) retrofit requirements to establish a total PM reduction requirement;

Allowing transit agencies in the South Coast Air Quality Management District (SCAQMD) that have elected to follow the “diesel path” a one time option of changing to the “alternative fuel path”;

Modifying the alternative fuel bus purchase provision for transit agencies on the diesel fuel path;

Authorizing the Executive Officer to grant small transit agencies a delay, if requested, in implementation of the regulation;

Modifying and including additional definitions for clarification of the urban transit bus fleet rule; and

Repealing the current certification procedure for PM retrofit devices adopted November 2000 and substituting the Board-adopted “Verification Procedures, Warranty, and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines,” [sections 2700 through 2710, title 13, California Code of Regulations (CCR)].

The interim certification procedures for heavy-duty hybrid-electric vehicles allow manufacturers flexibility in meeting certification requirements and provide a more accurate characterization of the emission benefits of hybrid-electric drive systems.

The rulemaking was initiated by a Notice of Public Hearing to consider modifications to the Public Transit Bus Fleet Rule and interim certification procedures for hybrid-electric urban transit buses released and made available to the public on September 6, 2002. The ARB

also issued a Staff Report: Initial Statement of Reasons (the Staff Report), entitled "Proposed Modifications to the Public Transit Bus Fleet Rule and Interim Certification Procedures for Hybrid-Electric Urban Transit Buses," for public review and comment on September 6, 2002. The Staff Report, which is incorporated by reference herein, described the rationale for the proposed amendments and certification procedure. The text of the proposed amendments to title 13, CCR sections 1956.1, 1956.2, 1956.4, 1956.8, and 2112 was included as an appendix to the Staff Report, as was the document "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles, in the Urban Bus and Heavy-duty Vehicle Classes" (Interim Certification Procedures). These documents were also posted by September 6, 2002, on the ARB's Internet site for the rulemaking at: <http://www.arb.ca.gov/regact/bus02/bus02.htm>.

On October 24, 2002, the Board conducted the public hearing, and received written and oral comments. At the conclusion of the hearing, the Board adopted Resolution 02-30, in which it approved the proposed amendments and certification procedures with modifications as offered in the staff presentation and in response to written and oral comments. The modifications included withdrawing the alternative fuel definition language changes proposed in the Staff Report, adding a definition for "heavy-duty pilot ignition engine", and adding hydrogen and gasoline (when used in hybrid-electric buses only) to the definition of "alternative fuel". In accordance with section 11346.8 of the Government Code, the Board's Resolution directed the Executive Officer to incorporate the modifications into the proposed regulatory text, with such other conforming modifications as may be appropriate, and to make the modified text available for a supplemental written comment period of at least 15 days. The Executive Officer was then directed to either adopt the amendments with such additional modifications as may be appropriate in light of the comments received, or present the regulations to the Board for further consideration if warranted.

The text of the proposed modifications to the originally proposed amendments to the regulations was made available for a supplemental 15-day comment period ending April 14, 2003, by issuance of a Notice of Public Availability of Modified Text (15-day notice or Notice). This Notice and its two attachments were mailed on March 28, 2003, to all parties identified in section 44(a), title 1, CCR, along with other interested parties. The 15-day notice and attachments were also posted March 28, 2003, on the ARB's Internet site for rulemaking. Resolution 02-30 was appended to the 15-day notice as Attachment 1. Attachment 2 contained the proposed title 13, CCR regulatory text showing the modifications proposed with the Notice. Attachment 2 also contained adopted regulatory language changes for a separate rulemaking for clarity.

Two comments were received during the supplemental comment period. After considering the comments received, the Executive Officer issued Executive Order G-03-023, adopting the amendments to title 13, CCR, and amending or adopting the incorporated documents.

### **Incorporation by Reference of Test Procedures and Federal Regulations**

The incorporated Interim Certification Procedures are identified in title 13, CCR, sections 1956.1(b), 1956.8(b), and 1956.8(d), by title and date. The ARB document is readily available from the ARB upon request and was made available in the context of this rulemaking in the manner specified in Government Code section 11346.5(b). The Code of Federal Regulations (CFR) is published by the Office of the Federal Registrar, National Archives and Records Administration, and is therefore reasonably available to the public from a commonly known source.

In accordance with ARB practice, the Interim Certification Procedures are incorporated by reference because it would be impractical, cumbersome, and expensive to print them in the CCR, as these procedures are highly technical and complex. They include the engineering protocols required for certification of vehicles and engines and have a very limited audience. Because the ARB has never printed complete test procedures in the CCR, the affected public is accustomed to the incorporation format. Moreover, printing portions of the ARB's test procedures that are incorporated by reference in the CCR would be unnecessarily confusing to the affected public.

The test procedures incorporate portions of the CFR because some of the ARB requirements are substantially based on the federal vehicular emissions regulations. Manufacturers typically certify engines to a version of the federal emissions standards and test procedures, which have been modified by state requirements. Incorporation of the federal regulations by reference makes it easier for manufacturers to know when the two sets of requirements are identical and when they differ. Each of the incorporated CFR provisions is identified by date in the ARB test procedure documents.

### **Economic and Fiscal Impacts**

The Board has determined that the proposed regulatory action will not create costs or savings, as defined in Government Code section 11346.5(a)(6), to any state agency or in federal funding to the state, costs or mandate to any local agency or school district whether or not reimbursable by the state pursuant to part 7 (commencing with section 17500), division 4, title 2 of the Government Code, or any other non-discretionary costs or savings to local agencies.

### **Consideration of Alternatives**

The Board has further determined that no alternative considered by the agency would be more effective in carrying out the purpose 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.

## **II. SUMMARY OF COMMENTS AND AGENCY RESPONSE**

### **45-day Comment Submittals**

The following transit-related organizations, industry groups, environmental organizations, and local air districts submitted written comments during the 45-day comment period:

- Allison Electric Drives (AED)
- American Lung Association; Coalition for Clean Air; Natural Resources Defense Council; Planning and Conservation League (Environmental Group)
- BAE SYSTEMS (BAE)
- California Transit Association (CTranA)
- ISE Research (ISE)
- Manufacturers of Emission Controls Association (MECA)
- Omnitrans
- San Francisco Municipal Railway (SF Muni)

Santa Barbara Metropolitan Transit District (SBMTD)  
South Coast Air Quality Management District (SCAQMD)  
Western States Petroleum Association (WSPA)

### **Oral Testimony at the October Hearing**

Representatives of the following transit-related organizations, industry groups, environmental organizations, and local air districts presented oral testimony at the hearing on October 24, 2002. Organizations identified with an asterisk (\*) also submitted written comments during the 45-day comment period.

Allison Electric Drives\* (AED)  
American Lung Association\* (ALA)  
BAE SYSTEMS\* (BAE)  
California Transit Association\* (CTranA)  
Dipetane Combustion Technologies  
Golden Gate Transit (GGT)  
ISE Research\* (ISE)  
Manufacturers of Emission Controls Association\* (MECA)  
Santa Clara Valley Transportation Authority (VTA)  
South Coast Air Quality Management District\* (SCAQMD)

More than half of the oral testimony was in support of the amendments. Golden Gate Transit and Dipetane Combustion Technologies were neutral regarding the proposals. Allison Electric Drives and BAE SYSTEMS opposed the Interim Certification Procedures.

### **15-day Comment Submittals**

Two comment letters were received in response to the Notice of Public Availability of Modified Text. ISE Research stated support for the inclusion of hydrogen and gasoline (when used in hybrid-electric buses only) in the definition of alternative fuel. The other letter opposed the inclusion of ethanol and methanol in the definition of alternative fuel, which did not pertain to the modified regulatory language available for comment. As such, the comment is not addressed in this FSOR.

### **Comment Summary and Agency Responses**

Set forth below is a summary of each objection or recommendation made regarding the specific regulatory actions proposed, together with an explanation of how the proposed action was changed to accommodate each objection or recommendation or the reasons for no change. The comments have been grouped by issue to the extent possible. Comments not involving objections or recommendations specifically directed to this rulemaking are not summarized below.

#### **A. Applicability**

1. Comment: Gross Vehicle Weight (GVW) used to determine transit bus applicability to this regulation should be changed from +33,000 pound GVW to +25,000 pound GVW to account for the new advances in bus chassis structure designs. (ISE)

Agency Response: This comment pertains to the definition of an urban bus as specified in section 86.094-2, Subpart N, Part 86, title 40, CFR. The definition of an urban bus in the fleet rule is based on the type of engine and duty cycle, or operation, of the bus, and is not based on GVW. Staff did not consider changing the definition of a transit, or urban, bus in this rulemaking but may do so in the future and will issue a hearing notice that encompasses such proposal if we do.

## **B. PM Reduction Requirements**

2. Comment: Some transit agencies that were proactive in reducing their overall fleet PM emissions are concerned about meeting the revised percent reduction schedule. (CTranA, Omnitrans, SBMTD)

Agency Response: Staff acknowledges that transit agencies that reduced their overall fleet diesel PM emissions prior to the January 1, 2002, baseline date may face difficulties in meeting the revised percent reduction schedule. The modifications to the diesel PM emission reduction requirement were necessary to result in equivalent reductions of diesel PM as would have resulted in the original requirement. Staff will continue to work closely with transit agencies to identify and implement diesel PM emission control strategies.

3. Comment: We request that either natural gas buses be included in the PM fleet averaging calculations or that reduction in the total annual diesel tonnage be the method of calculation instead of the PM fleet average calculation. Either of these strategies will benefit transit agencies that were proactive in reducing their PM fleet emissions. (Omnitrans)

Agency Response: Staff agreed with this comment, which was also received during the informal rulemaking process and made the suggested change. The declining PM fleet average proposal was rejected because the estimated emission reductions were fewer than the original requirement, and some transit agencies would have difficulty in meeting compliance deadlines. Calculating the reduction using total diesel particulate emissions, rather than a fleet average, has been incorporated into the PM reduction requirements.

4. Comment: We are concerned that the January 1, 2004, 40 percent fleet-average reduction in PM can only be attained by our agency by early retirement of a portion of our fleet. Services could be compromised. We request that the ARB recognize the unintended consequences of its new rules and allow the necessary latitude to ensure that service is not compromised. (SBMTD)

Agency Response: Staff analyzed several alternatives in developing the present regulation. In order to provide transit agencies with maximum flexibility in reducing diesel PM emissions, yet still aggressively reduce in-use diesel PM emissions, staff proposed rule changes that require that transit agencies reduce their total diesel PM emissions through 2009. Transit agencies can supplement their bus fleets by purchasing alternative-fuel buses, which are not included in the total diesel PM emission calculation. In addition, the proposed schedule is based on the implementation dates set in the original regulation's implementation schedule based on the fuel path selected by the transit agency. Some flexibility is included in the rule in the form of extensions for unavailability of technologies to comply. Transit

agencies should contact the ARB with detailed information, per the rule, if they have encounter difficulties with compliance.

5. Comment: We believe that it is improper to base the PM reductions on an apparent assumption that the original rule would have been completely implemented without exception. We believe implementation would be less than 100 percent and recommend that staff adjust the emission benefits downward to reflect an implementation rate of less than 100 percent. (WSPA)

Agency Response: The current analysis assumes a 90 percent implementation rate. Staff believes the rule change accurately reflects the emission reductions projected by the original regulation, and a downward adjustment of the emission benefits is not necessary or appropriate.

6. Comment: We note a shortfall in the particulate emission reductions over the 2003 through 2005 timeframe compared to the original plan, and urge the ARB to offset this shortfall to the extent possible in future years. It is not clear what the baselines are for each transit agency. Staff should report back when baseline emissions, as well as anticipated reductions from each transit agency, are calculated. (Environmental Group)

Agency Response: The Board will work to identify and implement particulate emission reductions from other sources during the 2003 through 2005 timeframe. However, the modifications to the PM reduction requirement result in greater diesel particulate emission reductions over the life of the rule than the original regulation. In addition, staff will continue to provide periodic reports to the Board.

### **C. Changing of Fuel Path**

7. Comment: There is no need for the rule change because few of the impacted fleets asked for the change. (WSPA)

Agency Response: Under the regulation, transit agencies selected a fuel path as of January 31, 2001, which may not be changed for the life of the rule. Some transit agencies located in the SCAQMD have asked staff in the past if they could change their fuel path, but were told the rule does not allow any change. Witnesses at the March 21, 2002, Board meeting asked the Board to allow transit agencies on the diesel path the option of changing to the alternative fuel path. The Board directed staff to analyze the impact of and need for such a change. As a result of staff's analysis, transit agencies in the SCAQMD are being allowed an opportunity to switch from the diesel path to the alternative fuel path.

8. Comment: It is unclear what environmental benefit is achieved by this change. (WSPA)

Agency Response: The Board directed staff to analyze the impact of and need for a rule change to allow transit fleets to switch fuel paths. A transit agency that changes now from the diesel path to the alternative fuel path will have a higher proportion of diesel buses and lower proportion of alternative fuel buses over the life of the rule. As such, the overall emission reductions achieved by the rule will be affected by a fuel path switch. The only transit agencies expressing an interest in changing to the

alternative fuel path are located in the SCAQMD. Therefore, staff limited the rule change to transit agencies within the South Coast Air Basin to limit any negative environmental impacts. Most transit agencies in the SCAQMD are subject to the district Rule 1192 requirement to purchase alternative-fueled buses. As such, the change in fuel path will have little or no negative impact on emissions reductions.

9. Comment: Provide a more comprehensive evaluation of the toxic emissions from Compressed Natural Gas (CNG) and Ultra Low Sulfur Diesel (ULSD) buses. (WSPA)

Agency Response: The ARB has conducted many studies of tailpipe emissions from in-use CNG and diesel buses. Additional information on the studies can be found at <http://www.arb.ca.gov/research/cng-diesel/cng-diesel.htm>. Staff expects minimal impact on emissions from this rule change, but will continue to evaluate the toxic emissions from diesel and alternative-fueled buses.

10. Comment: The SCAQMD fleet rule for transit buses does not require the CNG-powered buses to be equipped with any kind of aftertreatment devices; we believe this is relevant for evaluating the environmental impact of this rule change. (WSPA)

Agency Response: The ARB transit fleet rule is emission-based, specifying fleet and emission standards. Engine emission control technology is not specified for either the diesel or alternative-fuel path. The environmental impact of the rule change is discussed in the response to Comment 8.

11. Comment: For a given amount of funding, a transit agency could reduce emissions more by purchasing ULSD-powered vehicles instead of alternative-fueled vehicles, especially when replacing older vehicles. (WSPA)

Agency Response: As of July 1, 2002, all transit agencies (with a few exceptions) were required to power their urban buses with ULSD fuel. Although diesel buses are less expensive to purchase than alternative-fuel buses, most transit fleets in the SCAQMD are required to purchase alternative-fueled vehicles because they are subject to SCAQMD Rule 1192. Therefore these operators cannot purchase "ULSD-powered" vehicles.

12. Comment: This rule change is inconsistent with the Board's recent decision to reject SCAQMD's request to eliminate the diesel path from the ARB's transit fleet rule. (WSPA)

Agency Response: Comment noted; however at its March 21, 2002, meeting, the Board specifically requested staff to investigate allowing transit agencies on the diesel path the option of switching to the alternative fuel path. This rule change allows transit agencies in the SCAQMD an opportunity to switch paths. It is not inconsistent with the decision to retain the diesel path, but provides greater flexibility for these operators subject to district rules.

13. Comment: If the rule change is allowed, it will initiate a needless flurry of lobbying of local city councils, and transit agencies by advocates on this issue, needlessly

consuming time and resources that could be spent on cleaning the air and providing transit services. (WSPA)

Agency Response: Staff will continue to work closely with transit agencies subject to the provisions of the fleet rule, but doubts that additional time or resources will be necessary to discuss potential fuel path changes. Transit agencies considering a fuel path change will do so with the approval of their management, and will inform the ARB through the annual reporting mechanism.

14. Comment: Allow all fleets operating in the South Coast Air Basin the option to change their fuel path, not just those on the diesel path. (WSPA)

Agency Response: Staff was directed to analyze the impact of transit agencies switching to the alternative-fuel path only, not switching to either path. Although fuel path changes may affect the overall estimated emission reductions of the fleet rule, staff determined that there would be little or no impact on the emission benefits expected from the original regulation by allowing transit agencies in the SCAQMD the opportunity to switch to the alternative-fuel path. Additionally, the diesel path is not available to most transit fleets in the SCAQMD because of district Rule 1192, which requires the purchase of alternative-fueled vehicles.

#### **D. Diesel Path Emission Standards**

15. Comment: Allow diesel path transit agencies to purchase alternative-fuel engines during the 2004 through 2006 time period. (CTranA, Environmental Group, SCAQMD)

Agency Response: The ARB agrees and the regulation was changed to allow for diesel path agencies to purchase alternative-fuel buses meeting the alternative-fuel path engine standard during the 2004 through 2006 time frame.

16. Comment: Allow diesel path transit agencies to purchase diesel engines meeting the October 2002 diesel fuel engine standard during the 2004 through 2006 time period, using verified aftertreatment devices to reduce oxides of nitrogen (NOx) emissions. This would not reduce NOx emissions to the 2004 through 2006 new engine NOx emission standard, but would allow transit agencies to repower or replace coaches with much higher emissions. (CTranA)

Agency Response: In establishing the transit fleet rule, the ARB set standards for new engines purchased by transit agencies on each fuel path to ensure emission reductions were essentially equivalent for both the diesel path and the alternative fuel path over the life of the rule. Allowing diesel engines to meet the alternative-fuel NOx standard would be a relaxation of the regulation.

17. Comment: We request that the ARB ensure that alternative-fuel path properties may procure a limited fleet of diesel hybrid-electric buses (HEBs) for test purposes. (AED)

Agency Response: Transit agencies on the alternative-fuel path are allowed to purchase up to 15 percent diesel-fueled buses, including diesel HEBs. Diesel-fueled



buses, including diesel HEBs, must meet the California emission standards for urban bus engines on the diesel path.

18. Comment: We respectfully request the Board consider ways to expand the potential market for hybrid-electric drive by permitting agencies on both the alternative-fuel path and non-exempt diesel path to buy hybrid-electric diesel powered buses equipped with base engines certified to the federal 2004 standards and equipped with a verified retrofit filter. (BAE)

Agency Response: Transit agencies on the alternative fuel path are currently allowed to purchase up to 15 percent diesel-fueled buses, including diesel HEBs. However, all buses sold in California must be certified to California urban bus emission standards, which are more stringent than current federal standards. The approach requested by the commenter of using an engine certified to federal emission standards and equipped with a retrofit filter is not appropriate. The use of a retrofit device not included in the California new engine certification application to meet California emission standards is not permitted.

#### **E. Alternative NOx Strategy**

19. Comment: We request that the ARB extend the opportunity for transit agencies to submit an alternative NOx compliance plan even if they missed the original deadline, so that they can now evaluate their options given the availability of hybrids and a tool to quantify the benefits of this product. (AED, SF Muni)

Agency Response: The procedure for applying for the alternative NOx strategy was widely advertised to all transit agencies and all transit agencies were eligible to apply. Some transit agencies made this request at the September 20, 2001, the March 21, 2002, and the October 24, 2002, Board hearings. On all three occasions the Board elected not to reopen the application process for the alternative NOx strategy.

#### **F. Alternative Fuel Definition**

20. Comment: Defining advanced technologies such as dual-fuel engines utilizing natural gas and diesel fuel for pilot ignition as “alternative fuel” is a relaxation of the rule requirements. (Environmental Group, SCAQMD)

Agency Response: The ARB agrees and the proposed change to the definition of alternative fuel was withdrawn to reflect this comment. A definition for “heavy-duty pilot ignition engine” was made available in a 15-day notice to identify diesel pilot-ignition technology.

21. Comment: Gasoline is not classified as an alternative fuel for light-duty vehicles, but for purposes of clean air and emission standards, the gasoline hybrid bus we produce has lower emissions than CNG or diesel buses. The definition of “alternative fuel” in the fleet rule should be modified to include gasoline as used in the gasoline HEB. The definition should also include the use of hydrogen in internal combustion engines and fuel cells. (ISE)

Agency Response: The ARB agrees and gasoline (when used in hybrid-electric buses only) and hydrogen have been added to the definition of alternative fuel in the 15-day notice.

#### **G. Zero Emission Bus (ZEB) Technology**

22. Comment: There will be difficulties in implementing ZEB demonstrations because the costs for ZEBs are higher than expected and the technology development is a little slower than expected. (CTranA, GGT)

Agency Response: Staff is monitoring ZEB development and is aware of the challenges affecting implementation. However, this rulemaking does not pertain to section 1956.3, title 13, CCR.

23. Comment: The ARB should ensure newly built lighter-than-air fueling and maintenance facilities are designed to handle hydrogen in addition to natural gas to support the transition to the use of fuel cells. (Environmental Group).

Agency Response: Staff is aware of the need to support future fueling infrastructure to support fuel cell development and use. The ARB is working with the California Fuel Cell Partnership and the California Natural Gas Vehicle Partnership on infrastructure issues. However, this issue is more appropriately addressed outside of the regulatory process; please contact us if interested.

#### **H. Funding**

24. Comment: It is misleading to state that the federal government may fund up to 80 percent of the capital costs of retrofits or the purchase of new buses because, while the federal funds would reduce the actual cost of a retrofit, the transit operator would simultaneously lose the use of the same funds that had been applied to traditional service. (SBMTD)

Agency Response: The Staff Report states “Federal funds are available to cover 80 percent of the total cost of purchasing a new diesel urban bus and 83 percent of a new low emission alternative fuel bus.” Federal funds are not guaranteed for retrofits, although some grant funds may be available through various local, state, and federal agencies, including state and local air district incentive programs.

#### **I. Hybrid Certification Procedures- Definitions**

25. Comment: In the discussion of batteries in the Staff Report we suggest adding, at least, nickel sodium chloride, and strongly suggest listing lithium ion, lithium-metal-polymer, and fuel cell batteries. (ISE)

Agency Response: This comment pertains to the Technological Feasibility section of the Staff Report and not regulatory text. Staff recognizes continuing advancements in battery technology and will reflect this in future status reports.

26. Comment: As an interim measure for the next three years, to preclude the difficulties associated with extensive vehicle testing and allow some time for technology maturation, the claim of 25 percent NOx reduction from the engine’s certification

value seems reasonable. However, we believe the definition of a “hybrid-electric drive system” should be changed to include some minimum amount of on-board energy storage and regenerative braking to enable the vehicle to qualify for the 25 percent reduction. (ISE)

Agency Response: A thorough description of the hybrid-electric drive system is currently required in the certification application. Staff will consider modifying the definition of “hybrid-electric drive system” at a future date.

27. Comment: We believe that the selection of a baseline urban transit bus could be made arbitrarily by the ARB. The NOx emission level of the baseline urban transit bus should be determined and codified in the rule. (BAE)

Agency Response: The baseline urban transit bus will be selected to represent available conventional (non-hybrid-electric) technology. For 2004 through 2006 the diesel urban bus engine emission standards are 0.5 g/bhp-hr NOx and 0.01 g/bhp-hr PM. For alternative-fueled urban bus engines, the 2004 through 2006 emission standards are 2.4 g/bhp-hr NOx + non-methane hydrocarbons (NMHC) or 2.5 g/bhp-hr NOx + NMHC with a 0.5 g/bhp-hr NMHC cap and 0.01 g/bhp-hr PM. Staff anticipates reviewing and updating the hybrid certification procedure prior to the 2007 urban bus emission standards.

28. Comment: The definition of hybrid-electric drive system should exclude the engine and exhaust aftertreatment components. (AED)

Agency Response: The engine is an integral part of the propulsion system defined in “hybrid-electric drive system” and cannot be excluded. Exhaust aftertreatment components, if included in the certification package of the engine incorporated into a hybrid-electric drive system, cannot be excluded. The interaction of the engine, electric drive system, and aftertreatment components comprising the hybrid-electric drive system is important in assessing durability.

29. Comment: We strenuously oppose this apparent determination to include the hybrid-electric drive system as an emissions component. (BAE)

Agency Response: The hybrid-electric drive system includes both electric drive components and an auxiliary power unit. The auxiliary power unit incorporated into the propulsion system produces emissions. The hybrid-electric drive system cannot be operated without the auxiliary power unit, and therefore is an emissions component.

## **J. Hybrid Certification Procedures - Emission Standards**

30. Comment: There is still concern for hybrid coach emission standards and testing. In order for transit agencies to test this technology, flexibility is required in the emission standards and testing procedures. (CTranA)

Agency response: The interim certification procedures for hybrid-electric buses provide flexibility for manufacturers to meet urban bus emission standards through one-party certification, two-party certification, or engine certification with a 25 percent

NOx reduction. However, the actual emission standards for 2004 through 2006 must be met for certification and therefore are not subject to flexibility.

The test procedures for certification offer manufacturers the opportunity to more accurately measure the emission benefits of a hybrid-electric drive system and provide greater flexibility than what is currently available.

31. Comment: We wish HEB manufacturers to be able to come into the California market on more than an experimental basis with a yearly waiver. (GGT)

Agency Response: Manufacturers intending to market HEBs in California are able to certify a product using the Interim Certification Procedures, and are no longer limited to the use of experimental permits. A limited number of pre-production HEBs are operating in demonstration projects in California with experimental permits, which are available for the testing of pre-production technology and are issued for one-year with annual renewals. Manufacturers delivering a product beyond the pre-production phase are expected to certify a product meeting California emission standards.

#### **K. Hybrid Certification Procedures - Engine Certification**

32. Comment: We request that the ARB permit the sale of hybrid-electric urban buses equipped with 49-state certified urban bus engines and equipped with verified diesel particulate filters (DPFs) between 2002 and 2007, instead of requiring the use of an engine certified to California emission standards. The 49-state certified urban bus engine with a verified DPF will meet California emission standards. (BAE)

Agency Response: The engine manufacturer may include a verified DPF (verified following California's verification procedures) on a California certified engine by submitting additional testing data and a justification for use. The approach suggested by the commenter is not appropriate because a third party may not alter a 49-state certified engine to meet California emission standards through the use of aftertreatment devices. The engine must be certified to California emission standards.

33. Comment: The ARB has indicated that the DPF must be first-fit certified with the engine manufacturer. We strongly oppose this requirement because we believe that no hybrid-suitable engines with certified first-fit DPF will be offered for commercial sale in California. The California Urban Bus emission standards for PM can be met with a verified DPF retrofitted to 49-state certified Urban Bus engines. We propose adding text to CCR title 13 1956.1(a)(7) to allow manufacturers to meet the PM emission standard with a base engine certified to the 2004 through 2006 NOx and CO standards, equipped with an aftertreatment system that reduces PM to 0.01g/bhp-hr. 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. (AED, BAE)

Agency Response: Section 1956.1(a)(7), title 13, CCR, states that manufacturers may meet the PM emission standard with an aftertreatment system. The DPF is not required to be first-fit certified with the engine. However, the engine manufacturer is

required to supply additional testing data if a California verified DPF is added after original certification. The modifications to title 13, CCR, section 1956.1(a)(7) proposed by the commenter are not appropriate because the aftertreatment system is subject to the same requirements as the engine with which it is packaged. Please also review the response to Comment 33 regarding the ability of a third party to alter a 49-state certified engine to meet California emission standards.

34. Comment: Changes to title 13, CCR, section 1956.1(a)(11) would also need to be made for consistency with the changes proposed in section 1956.1(a)(7). (BAE)

Agency Response: Please review the responses to Comments 32 and 33. Engines and hybrid-electric drive systems in transit buses operating in California must be certified to meet California emission standards.

35. Comment: We request that the 25 percent reduction claim paragraph in the Interim Certification Procedures be moved into the main body of the urban bus rule regulation so that the 25 percent benefit claim for 2004 through 2006 can be made without triggering the administrative procedure requirements of the Interim Certification Procedures. (BAE)

Agency Response: It is not appropriate to include this provision in the body of the Fleet Rule for Transit Agencies, as it pertains to the certification process for hybrid-electric drive systems, and certification procedures are not addressed in the fleet rule. The 25 percent reduction claim is one provision for heavy-duty hybrid-electric drive system certification. The administrative procedures are a part of the certification process and cannot be bypassed.

36. Comment: We ask that the ARB allow medium heavy-duty diesel engines to be certified with an alternative "useful life" provision. (AED, SBMTD)

Agency Response: This comment pertains to emission standards using two-party certification of the hybrid-electric drive system. Two-party certification allows for separate Executive Orders for the engine and hybrid-electric drive system. If two-party certification is requested, the engine used in an urban transit HEB must meet the emission standards and useful life provisions of an urban bus engine. The medium heavy-duty diesel engine referred to in the comment is not certified to California urban bus standards. An alternative "useful life" provision for medium heavy-duty diesel engines does not provide transit agencies purchasing this technology with a product meeting the durability standards of an urban bus.

However, a medium heavy-duty diesel engine is not subject to the same requirements if incorporated into a hybrid-electric drive system using one-party certification. With one-party certification, one Executive Order is issued for the hybrid-electric drive system. If a manufacturer certifies with one-party certification, the hybrid-electric drive system must meet urban bus emission standards, but the certified engine incorporated in the hybrid-electric drive system is not required to meet urban bus emission standards or useful life.

## **L. Hybrid Certification Procedures - Useful Life**

37. Comment: We do not believe that the inclusion of diesel and hybrid-electric buses in the definition of “useful life” is necessary or prudent given the lack of durability information for certain subcontracted components, specifically the battery electric storage devices and the fact that they are a replacement item that would not last the life of the bus. (BAE)

Agency Response: Staff believes it is appropriate for hybrid-electric urban buses to have a useful life requirement identical to conventional urban transit buses. However, for the interim period (model years 2004 through 2006), hybrid-electric drive systems have a relaxed useful life requirement of 5 years or 150,000 miles, whichever comes first. Although durability information of all components is not known, it is important for transit agencies to be assured that a transit bus will meet a standard period of service regardless of technology.

38. Comment: We were unable to find an equivalent period of use requirement for alternative fuel buses in title 13 section 2112(l)(20). We assume that the ARB does not wish to impose regulations on diesel-electric hybrid buses that are more stringent than those rules imposed on alternative-fueled buses. (BAE)

Agency Response: The useful life provisions for heavy-duty diesel engines in title 13 section 2112(l)(20) also apply to natural gas-fueled engines and liquefied petroleum gas-fueled engines. Useful life requirements are identical for diesel and alternative fuel urban bus engines.

39. Comment: We request clarification as to whether the useful life paragraph in the Interim Certification Procedures is applicable if the hybrid manufacturer does not certify and instead claims the 25 percent benefit. (BAE)

Agency Response: If a manufacturer uses engine certification with a 25 percent NOx reduction to certify a hybrid-electric drive system, the useful life provision in the Interim Certification Procedures will apply to the hybrid-electric drive system. A manufacturer may not claim a 25 percent NOx benefit without certification.

40. Comment: The useful life assignment in the Interim Certification Procedures is redundant. (AED)

Agency Response: The useful life requirement in the Interim Certification Procedures pertains to the hybrid-electric drive system and is not redundant. If two party certification is used, a separate useful life for the engine will apply to the engine.

## **M. Hybrid Certification Procedures - Verification**

41. Comment: We urge the ARB to use verification rather than certification to regulate the emerging heavy-duty hybrid industry. (BAE)

Agency Response: Staff believes the production of heavy-duty hybrid-electric vehicles is at a stage where certification is appropriate. Transit agencies investing in this technology must have assurance that their purchases are as durable as

conventional transit buses. The Interim Certification Procedures provide flexibility for manufacturers through different options for certification (one-party, two-party, engine with 25 percent NOx reduction) and relaxed useful life and durability testing requirements. The interim period is intended to allow manufacturers time to meet more stringent enforcement requirements beginning in 2007.

42. Comment: We request that the ARB consider verification of hybrid technology beyond the 25 percent credit already included in the proposed rule to qualify it for incentive financing and ensure in use compliance. (BAE)

Agency Response: The emission benefits of hybrid-electric technology can be quantified using the hybrid-electric drive system test procedures in the Interim Certification Procedures. Staff's rationale for requiring certification instead of verification is in the response to Comment 41.

43. Comment: We believe that the certification of hybrid emissions would garner little additional benefit after 2007 due to the significantly reduced base engine emission standards. We remain steadfast in our belief that less burdensome verification according to the ARB SAE J2711 procedure would provide a better interim solution between 2004 and 2006. (BAE)

Agency Response: Staff believes that the Interim Certification Procedures are not burdensome and are appropriate for this initial period. Staff will consider proposing modifications to the Interim Certification Procedure before the 2007 stringent emission standards come into effect if necessary. Please also review the response to Comment 41.

#### **N. Hybrid Certification Procedures - Emission Factor Determination and Application**

44. Comment: Because the method the ARB will use to calculate a baseline emission factor has yet to be determined, we have no assurance that an unrealistically low baseline emission factor will be calculated, effectively closing the door on hybrid-electric diesel buses. (BAE)

Agency Response: The method for calculating a baseline emission factor is found in section E.1. of the Interim Certification Procedures. Calculation of a baseline emission factor will be affected by the selection of a baseline urban transit bus. The baseline transit bus will reflect available technology; for 2004 through 2006, the baseline bus will meet 2004 through 2006 emission standards. It is more likely that the baseline emission factor will be high (relative to the hybrid-electric bus) than low.

45. Comment: The purpose of certifying a hybrid system should be to allow transit agencies to account for the emissions benefit and for California to ensure that they are maintained. The best way to do both is to certify the emissions factor. (AED)

Agency Response: Staff agrees that an emissions factor is useful in hybrid certification and has incorporated the concept. However, the emissions factor itself cannot be certified. Certification is done on the basis of meeting emission standards. The emissions factor is calculated from engine dynamometer and chassis dynamometer testing of a representative conventional transit bus or hybrid-electric

transit bus. An emissions factor is an intermediate step in calculating the certification value of a hybrid-electric drive system, and cannot be compared to existing emission standards.

46. Comment: We, as a systems supplier, do not produce emissions. We improve them. So we are not asking for an emissions certification. We're asking for a percent-improvement determination. (AED)

Agency Response: A hybrid-electric drive system incorporating an engine produces emissions, although substantially less than a conventional engine for a given application. The calculation of an emission factor ratio is an intermediate step in the determination of the certification value of the hybrid-electric drive system. The emissions factor ratio is indicative of the emissions reduction benefit of a hybrid-electric drive system, but is not appropriate for use as a certification standard. In addition, engine durability and aftertreatment interaction do not allow a completely independent assessment of individual components. Therefore, it is more appropriate for the hybrid-electric drive system to be certified.

#### **O. Hybrid Certification Procedures - Warranty**

47. Comment: An HEB family with fewer than 50 HEBs sold for the 2004 through 2006 should be exempt from emissions warranty requirements. (AED)

Agency Response: An exemption from the emissions warranty is not appropriate. The emission reductions attributed to a hybrid-electric drive system must be sustained for a reasonable period of use at no additional cost to the purchaser. Manufacturers are exempt from durability-data vehicle and emission-data vehicle testing for HEB families with less than 50 HEBs sold for the 2004 through 2006 model years.

48. Comment: The emissions warranty for the hybrid-electric drive system should be the same as the basic warranty provided by the manufacturer for model years 2004 through 2006. (AED)

Agency Response: Purchasers of HEBs must be assured that the emission benefits of hybrid-electric drive systems are as durable as conventional transit buses. For that reason, the emission warranty for a hybrid-electric drive system is the same as that for a conventional engine, and is separate from the basic warranty of the system provided by the manufacturer.

#### **P. Miscellaneous**

49. Comment: We are concerned that battery replacement would fall under the rebuild provision in section 9 of the Interim Certification Procedures. These and other components should be considered consumable and not subject to the recordkeeping requirements. (BAE)

Agency Response: The rebuild provisions and recordkeeping requirement in the Interim Certification Procedures pertain to the process of engine rebuilding. Battery replacement is not subject to the rebuild provisions and recordkeeping requirements.



50. Comment: We ask that hybrid buses be made available for testing at reduced costs similar to what has been done before for particular instances as ordered by the Executive Officer. (ISE)

Agency Response: Funds are available through local agencies to assist small companies. The Innovative Clean Air Fund, administered by the ARB, has also provided financial support for companies towards commercialization of products designed to clean up the air. Contact information is available at <http://www.arb.ca.gov/research/icat/icat.htm>.

51. Comment: We encourage the ARB to reassert its belief that HEBs are a relatively new but promising technology for urban transit buses that can provide transit agencies with another option for reducing both NOx and PM. (SF Muni)

Agency Response: Staff agrees that hybrid-electric drive systems for heavy-duty applications such as transit buses are a promising technology. The Executive Officer stated during the October 24, 2002, public hearing that “hybrid technologies in all their forms – whether they’re diesel, alternative fuels, or whatever – are something that actually are very enticing and very encouraging.”

52. Comment: It does not appear the ARB has provided any responses to our suggestions made prior to the 45-day public notice and comment period. We believe that if this matter proceeds to decision without any recognition of and response to our comments and suggestions, the Board will have acted in violation of the California Administrative Procedures Act (APA) requirement to “consider all relevant matter presented to it during a comment period before adopting, amending, or repealing any regulation.” (WSPA)

Agency Response: The commenter is referring to comments received by the ARB prior to the 45-day public comment period, during the informal workshop and consultation period that precedes the formal rulemaking. These comments were considered by the ARB prior to formally noticing the rule as well as before final adoption of the regulation, as outlined in Resolution 02-30. Further, the ARB's responses to comments are set out in this FSOR, as required by the APA (Government Code, sections 11340 *et seq.*).