California Environmental Protection Agency

Air Resources Board

STAFF REPORT: INITIAL STATEMENT OF REASONS

PUBLIC HEARING TO CONSIDER THE ADOPTION OF A PARTICULATE MATTER EMISSIONS MEASUREMENT ALLOWANCE FOR CALIFORNIA'S HEAVY-DUTY DIESEL IN-USE COMPLIANCE REGULATION

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EXECUTIVE SUMMARY

In 2006, the Air Resources Board (ARB or Board) adopted a new in-use compliance program (ARB (2006)) that allows for a more efficient and cost-effective method to conduct in-use compliance testing of 2007 and newer heavy-duty diesel engines (HDDE). This new program, called the manufacturer-run heavy-duty diesel in-use testing (HDIUT) program, requires HDDE manufacturers to test a set number of their certified engine families each year using portable emission measurement systems (PEMS) installed on selected heavy-duty trucks. The HDIUT program evaluates HDDE compliance with the Not-to-Exceed (NTE) emission test limits for non-methane hydrocarbons, carbon monoxide, oxides of nitrogen, and particulate matter (PM). The NTE emissions test limits are part of the certification requirements for HDDE. The NTE test limits are not associated with a prescribed test cycle, but rather apply to a wide range of engine operation that can be expected to occur during normal highway operation. An engine family that exceeds the in-use NTE limits is subject to remedial action.

The adopted HDIUT program initially incorporated temporary gaseous and PM measurement allowances. Measurement allowances account for the difference between emission measurement error when tested utilizing PEMS and measurement error when tested with laboratory grade instruments in a laboratory setting. Prior to the adoption of the HDIUT rule, an agreement was made with ARB, the United States Environmental Protection Agency (U.S. EPA), and the Engine Manufacturers Association (EMA), along with individual HDDE manufacturers, to fund the development of measurement allowances through two comprehensive research studies: one for gaseous emissions, the other for PM emissions (ARB, U.S. EPA, EMA (2005a)). Accordingly, these research studies were initiated through the guidance of a Measurement Allowance Steering Committee comprised of members from ARB, U.S. EPA, and EMA (ARB, U.S. EPA, EMA (2005b), ARB, U.S. EPA, EMA (2010)). Extensive testing, statistical modeling, and model validation utilizing three different PEMS devices and test methodologies have been completed by the main contractor, Southwest Research Institute (SwRI), in San Antonio, Texas, with the help of the University of California's (at Riverside) Center for Environmental Research and Technology (CE-CERT).

The intent of the research studies was to develop a single set of measurement allowances that would replace the temporary allowances in the adopted rule. A set of gaseous measurement allowances was adopted by the Board in December 2007 after a successful conclusion of the gaseous research study.

A similar research study was initiated with both SwRI and CE-CERT in 2008 to develop a measurement allowance for PM emissions. The PM measurement allowance study was completed in November 2010 (SwRI (2010), CE-CERT (2010)). Based on the results of this study, ARB, U.S. EPA, and EMA agreed on setting a PM measurement allowance value at 0.006 grams per brake horsepower-hour for the HDIUT program.

If adopted, this PM measurement allowance would be added to the NTE PM emission limit to compensate for testing uncertainties when performing compliance testing using PEMS.

Economic and Air Quality Impacts

Staff's proposal would replace the current, temporary PM measurement allowance value with the PM measurement allowance value developed and validated through the extensive research study completed in November 2010 (SwRI (2010), CE-CERT (2010)). Although the proposed PM measurement allowance is more stringent than the temporary allowance previously adopted, U.S. EPA has already adopted the proposed amendment (U.S. EPA (2010)). Therefore, adoption of these proposed amendments would not result in any additional economic impacts from compliance. The impact on air quality is expected to be minimal. No impact on private businesses or persons is expected.

I. INTRODUCTION

This staff report with associated appendices represents the Initial Statement of Reasons (ISOR) for Proposed Rulemaking required by the California Administrative Procedures Act. In this report, the Air Resources Board (ARB or Board) staff presents the proposed adoption of a particulate matter (PM) emissions measurement allowance for California's Heavy-Duty Diesel In-Use Compliance Regulation through amendments to section 1956.8, title 13, California Code of Regulations and the incorporated "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles."[1]

The federal Clean Air Act grants California the authority to adopt and enforce rules to control mobile source emissions within California. In 2006, ARB adopted a new in-use compliance program (ARB (2006)) that allows for a more efficient and cost-effective test method to assess in-use compliance of heavy-duty diesel engines (HDDE). This new testing method, called the manufacturer-run heavy-duty diesel in-use testing (HDIUT) program, requires HDDE manufacturers to test a set number of their certified engine families each year using demonstrated and proven portable emission measurement systems (PEMS).[2] Based on the engine family to be evaluated, heavy-duty trucks are selected and then tested while operating in normal revenue service. An engine family that "fails," based on an established pass/fail protocol, is subject to remedial action. The previous method to conduct in-use compliance testing required the removal of an engine from a selected vehicle and installation of that engine on an engine dynamometer. Such a procedure is very costly and time consuming.

The adopted HDIUT program was developed through a collaborative effort with ARB, the United States Environmental Protection Agency (U.S. EPA), and the Engine Manufacturers Association (EMA), along with individual HDDE manufacturers (ARB, U.S. EPA, EMA (2003)). The success of this testing program primarily depends on ensuring that the PEMS can correctly measure the exhaust emissions from heavy-duty trucks in the field. Compared to a controlled laboratory setting, these in-field instruments can potentially be influenced by uncontrollable factors such as ambient conditions and mechanical vibration. Thus, to address this issue (as well as other testing/protocol issues), the HDIUT program called for a two-year manufacturer-run pilot program focusing on testing issues related to gaseous emissions, followed by another two-year manufacturer-run pilot program focusing on testing issues related to PM emissions. Specifically, the major objective of the pilot programs was to provide HDDE manufacturers time to work out the "bugs" before a fully enforceable in-use compliance program took effect.

To address the accuracy measurement uncertainties related to PEMS, two separate research studies were initiated to specifically determine measurement allowances for

[1] A complete set of the existing test procedures, as amended on September 27, 2010, is available at http://www.arb.ca.gov/msprog/onroadhd/hddtps_clean_warranty_12-10.pdf.
[2] PEMS units must meet the requirements of 40 CFR 1065 Subpart J.

each pollutant by accounting for any potential difference in measurement accuracy between PEMS and laboratory grade instruments (ARB, U.S. EPA, EMA (2005b), ARB, U.S. EPA, EMA (2010)). Under the pilot programs, temporary measurement allowances (in units of grams per brake horsepower-hour (g/bhp-hr)), were used as placeholders until the final measurement allowances were determined.[3] In 2007, the first research study completed its work on developing "final" gaseous measurement allowances.[4] The gaseous measurement allowances were subsequently adopted by the Board in December of that year (ARB (2007)). In 2010, the second research study completed its work on developing a "final" PM measurement allowance, a value of 0.006 g/bhp-hr. The U.S. EPA adopted this measurement allowance in their HDIUT program in November 2010 (U.S. EPA (2010)). ARB staff is now proposing to adopt this PM measurement allowance in its HDIUT program.

II. BACKGROUND

In January 2001, the U.S. EPA adopted new HDDE emission standards, along with the "Not-to-Exceed" (NTE) and other test requirements for 2007 and subsequent model year engines. In October 2001, ARB harmonized with the federal program by adopting identical requirements. The NTE requirement allows testing on an engine dynamometer, chassis dynamometer, or with PEMS during over-the-road operation. The maximum allowable NTE emissions, the NTE limits, when averaged over a minimum time of 30 seconds, must not exceed an emission limit that is a multiple of the Federal Test Procedure (FTP) emission standards. Specifically, the NTE limits apply to non-methane hydrocarbons, carbon monoxide, oxides of nitrogen, and PM. The test procedure for the NTE limits is different from all previous HDDE test procedures in that it is not based on any kind of test cycle, but instead allows testing over a wide range of engine and ambient conditions that can occur under any normal operating conditions. The NTE limits, as well as other provisions of the 2007 HDDE rule, were intended to ensure that engines and vehicles designed to meet the original laboratory-based FTP emission standards continued to effectively control emissions under all driving conditions reasonably expected to occur during normal vehicle use.

In late 2001, EMA challenged ARB's and U.S. EPA's adoption of the NTE limits. This led to lengthy negotiations with the HDDE manufacturers which ultimately resulted in an agreement to develop a manufacturer-run in-use compliance program. Consequently, on May 9, 2003, ARB, the U.S. EPA, and EMA mutually developed a detailed outline (ARB, U.S. EPA, EMA (2003)) for a future regulation for in-use testing of HDDEs. Based on this collaborative effort, U.S. EPA adopted the HDIUT program in June 2005, and, as previously discussed, in September 2006 ARB adopted an identical program (ARB (2006)). As part of this effort, ARB, the U.S. EPA, and EMA agreed to develop an improved set of measurement allowances (i.e., to replace the temporary measurement

[3] These temporary pilot program measurement allowances were adopted by the Board when it adopted the original heavy-duty in-use compliance regulations in 2006. They were: NMHC = 0.17 g/bhp-hr, NOx = 0.50 g/bhp-hr, CO = 0.60 g/bhp-hr, and PM = 0.10 gm/bhp-hr.

[4] The HDIUT program's final gaseous measurement allowances (replacing the temporary gaseous measurement allowances) are: NMHC = 0.01 g/bhp-hr, NOx = 0.15 g/bhp-hr, and CO = 0.25 g/bhp-hr.

allowances), and thus as a supplement to the manufacturer-run pilot programs, the research studies were soon initiated (ARB, U.S. EPA, EMA (2005a)).

In 2005, the gaseous emissions research study got underway through the guidance of a Measurement Allowance Steering Committee (MASC) comprised of members from ARB, U.S. EPA, and EMA (ARB, U.S. EPA, EMA (2005b)). Southwest Research Institute (SwRI) and the University of California's (at Riverside) Center for Environmental Research and Technology (CE-CERT) were selected to conduct the study. The gaseous emissions research study involved extensive engine and environmental testing, statistical modeling, and model validation utilizing three different PEMS devices and methods to determine the lowest measurement allowances. As previously mentioned, following the successful completion of this study, the Board adopted a set of gaseous measurement allowances for the HDIUT program in December 2007 (ARB (2007)).

A similar research study was initiated again with SwRI and CE-CERT in 2008 to develop a measurement allowance for PM emissions (ARB, U.S. EPA, EMA (2010)). This study also involved extensive engine and environmental testing, statistical modeling, and model validation utilizing three different PEMS devices and methods to determine the lowest measurement allowance. The PM measurement allowance study was completed in November 2010 (SwRI (2010), CE-CERT (2010)) and staff's current proposal requests that the Board adopt the PM measurement allowance derived from this study.

III. SUMMARY OF PROPOSAL

A. APPLICABILITY

The proposed amendments to the HDIUT program would apply to PM emissions on engine dynamometer certified 2011 and subsequent model year diesel engines installed in vehicles with gross vehicle weight ratings greater than 8,500 pounds.

B. MEASUREMENT ALLOWANCE

1. OVERVIEW

Under an agreement with ARB, U.S. EPA, and EMA, it was recognized that measurement allowances for each regulated pollutant would need to be developed before an enforceable HDIUT program could commence (ARB, U.S. EPA, EMA (2005a)). The measurement allowance represents the incremental error between measuring emissions under controlled conditions in a laboratory with lab-grade equipment, and measuring emissions in the field using PEMS. Thus, in practical terms, a measurement allowance of "X" would be added to the NTE emission limit plus the in-use compliance testing margin to calculate the

NTE threshold value against which all emission results are compared for compliance determination.

In early 2005, ARB, U.S. EPA, and EMA agreed to use a temporary PM measurement allowance value of 0.10 g/bhp-hr for the PM pilot program (ARB ISOR (2006)). It was also agreed that this value would be revised once the measurement allowance value was determined through a coordinated research study.

To this end, in 2008, ARB, U.S. EPA, and EMA, through the work of the MASC, implemented the PM measurement allowance research study (essentially a continuation of the previously completed gaseous measurement allowance study) with SwRI and CE-CERT (ARB, U.S. EPA, EMA (2010)). As previously mentioned, the research study evaluated three different PEMS devices and test methodologies. Specifically, the PEMS devices included Sensors' Portable Particulate Measuring Device, Horiba's Transient Real Time Particulate Matter Device, and AVL's Micro Soot Sensor. At the time only one of these PEMS devices, AVL's Micro Soot Sensor, successfully passed the model validation phase of the program. However, in parallel with this study, additional testing was conducted by CE-CERT that ultimately led to the validation of Sensors' Portable Particulate Measuring Device. Thus, both AVL's Micro Soot Sensor and Sensors' Portable Particulate Measuring Device are deemed acceptable for conducting PM testing under the HDIUT program.

2. STAFF'S PROPOSAL

Based on the successful completion of the PM measurement allowance research study and on the recommendation of the MASC, an agreement was reached among ARB, U.S. EPA, and EMA on a final PM measurement allowance value of 0.006 g/bhp-hr. The U.S. EPA adopted this PM measurement allowance value in their HDIUT regulation through a Direct Final Rule in November 2010 (U.S. EPA (2010)).

Since ARB's HDIUT program is essentially identical to the U.S. EPA's program, staff is proposing the adoption of a final PM measurement allowance value of 0.006 g/bhp-hr which would replace the temporary PM measurement allowance value (0.10 g/bhp-hr) adopted in the HDIUT program in 2006. The adoption of this final PM measurement value can be accomplished by amending the HDDE test procedures: "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as last amended September 27, 2010. Section 1956.8, title 13, California Code of Regulations, which incorporates the above HDDE test procedure, would also be amended to reflect the updated test procedures.

Staff is also proposing other minor amendments to the above test procedures to correct an oversight in a previous rulemaking. Specifically, staff is proposing to

add language to the test procedures for the exemption of armored vehicles and workover rigs from the engine shutdown system requirements. In December 2008, the Board adopted these exemptions in the modification made to section 1956.8, title 13, California Code of Regulations (ARB (2008)). However, staff did not include these changes to the incorporated test procedures. This proposed action would rectify this oversight.

The proposed PM measurement allowance used for measuring PM emissions is necessary for the successful implementation of California's heavy-duty diesel in-use compliance regulations. Specifically, the use of a PM measurement allowance when conducting in-use testing of 2011 and newer HDDEs will allow for an effective and enforceable in-use compliance program for HDDEs and ensure that the PM emission benefits expected from the adopted HDDE emission standards are realized.

IV. COMPARISON BETWEEN CALIFORNIA AND FEDERAL REGULATIONS

The U.S. EPA has already adopted staff's proposed PM measurement allowance in November 2010 through a Direct Final Rule (U.S. EPA (2010)). With regard to the HDIUT program in general, U.S. EPA's and ARB's programs are identical. Specifically, the engine family selection, test vehicle selection, testing protocol, test data collection and reporting (including gaseous and PM measurement allowances), pass/fail criteria, etc., are all identical to the U.S. EPA's rule. One difference in ARB's program is that ARB also has the authority to independently pursue remedial action on a non-complying engine family. This authority to enforce its own regulations is consistent with all ARB programs.

V. ECONOMIC IMPACTS

A. LEGAL REQUIREMENTS

The economic impacts analysis shown in this report was conducted to meet current legal requirements under the Administrative Procedures Act. Government Code section 11346.3 requires state agencies adopting and amending any administrative regulation to identify and assess any potential for adverse economic impacts on California businesses and individuals. State agencies are also required to estimate the cost or savings to any state or local agency and school districts. The assessment shall include a consideration of the impact of the proposed regulation on California jobs, business expansion, elimination or creation, and the ability of California business to compete with business in other states.

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

saving to the local agencies and the cost or saving in federal funding to the State. These issues are addressed below.

B. AFFECTED BUSINESSES

Because U.S. EPA has already adopted the proposed amendments (U.S. EPA (2010)) and HDDE manufacturers produce engines for a single, national market, there would be no additional or incremental costs associated with adopting these proposed amendments and no impact on private businesses or persons who purchase these engines is expected. Also, there is no impact expected on PEMS manufacturers.

C. POTENTIAL COSTS TO ENGINE MANUFACTURERS

As stated above, because U.S. EPA has already adopted this PM measurement allowance, staff expects no additional incremental costs on the HDDE manufacturers associated with ARB's adoption of the same PM measurement allowance value.

D. POTENTIAL IMPACTS ON BUSINESS COMPETITIVENESS

The proposed regulation amends an existing regulation by replacing a temporary measurement allowance and is not expected to adversely impact the ability of California businesses to compete with similar businesses in other states, due to similar federal regulation.

E. POTENTIAL IMPACTS ON JOBS AND BUSINESS CREATION, ELIMINATION, OR EXPANSION

The proposed regulation is not expected to significantly impact the creation, elimination or expansion of jobs and businesses in California beyond what is already covered by the adoption of the existing HDIUT program.

F. POTENTIAL COSTS TO LOCAL AND STATE AGENCIES

The proposed amendments to the procedure will not create costs or savings, as defined in Government Code Section 11346.5(a)(6), to any State agency or in federal funding to the State, costs or mandate to any local agency or school district whether or not reimbursable by the State pursuant to Part 7 (commencing with Section 17500, Division 4, Title 2 of the Government Code), or other non-discretionary savings to local agencies. The staff has not encountered information that indicates that any of these impacts are to be expected.

No additional net costs for local and state agencies will be accrued as a result of the proposed regulation.

VI. ENVIRONMENTAL IMPACTS

A. AIR QUALITY IMPACTS

The California Environmental Quality Act and ARB policy require an analysis to determine the potential adverse environmental impacts of proposed regulations. Public Resources Code, Section 21080.5 allows public agencies with regulatory programs to prepare a plan or other written document in lieu of an environmental impact report once the Secretary for Resources has determined that the agency meets the criteria for a Certified State Regulatory Program (Title 14, California Code of Regulations, section 15250). The Secretary for Resources has certified ARB's program for the adoption of regulations (Title 14, California Code of Regulations, section 15251(d)). This certification allows ARB to include an environmental analysis in the Initial Statement of Reasons for the adoption of the regulations, in lieu of preparing an environmental impact report or negative declaration. In addition, ARB will respond in writing to all significant comments that pertain to potential environmental impacts raised by the public during the public review period or at the Board hearing. These responses will be contained in the Final Statement of Reasons for the regulation.

Staff evaluated the potential environmental impacts from the proposed regulation and determined that no significant adverse environmental impacts are likely to result from the proposal. Further, staff has determined that adoption of the proposed regulation will not result in any significant adverse impacts on water quality, land, or biological resources.

This determination was made because the proposed regulation requires only the implementation of the adopted HDIUT program, which will ensure that the expected emission benefits of 2007 HDDE standards are realized. The HDIUT program will encourage HDDE manufacturers to design and build robust engines and emission control systems to comply with the emission requirements during their useful life in order to avoid failure of in-use compliance testing which could ultimately lead to costly recalls or extended parts warranties. These activities produce no adverse environmental impacts, and there may be slight improvement in air quality due to the adoption of a more stringent PM measurement allowance for the HDIUT program.

B. ENVIRONMENTAL JUSTICE

State law defines environmental justice 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 (Senate Bill 115, Solis; Stats 1999, Ch. 690; Government Code § 65040.12(c)). The Board approved Environmental Justice Policies and Actions on December 13, 2001, to establish a framework for incorporating environmental justice into ARB's programs consistent with the directives of State law. The

policies subsequently developed apply to all communities in California, but they recognize that environmental justice issues have been raised more in the context of low income and minority communities, which sometimes experience higher exposures to some pollutants as a result of their proximity to multiple sources of air pollutants.

Actions of the ARB, local air districts, and federal air pollution control programs have made substantial progress towards improving the air quality in California. However, some communities continue to experience higher exposures than others because of the cumulative impacts of air pollution from multiple sources.

Adoption and implementation of this regulation will have no negative environmental impacts on environmental justice communities. The proposed regulation would benefit all Californians by ensuring that HDDEs comply with certification emission standards throughout their useful life. Communities located in proximity to ports, distribution centers, and other areas with high heavy-duty diesel vehicle activity would particularly benefit from the proposed regulation.

VII. REGULATORY ALTERNATIVES

No other alternatives to the proposed requirement have been evaluated since the proposed PM measurement allowance is necessary in order to effectively enforce the PM emission requirements of the adopted HDIUT program.

VIII. REMAINING, NON-CONTROVERSIAL ISSUES

There are no specific issues, controversial or otherwise, related to this proposal or its potential impact on the implementation of the adopted HDIUT program.

IX. SUMMARY AND RATIONALE FOR PROPOSED REGULATIONS

The proposed regulation, “Adoption of a Particulate Matter Emissions Measurement Allowance for California’s Heavy-Duty Diesel In-Use Compliance Regulation,” would allow for the enforcement of in-use compliance of heavy-duty diesel trucks under the HDIUT program. The proposed amendments would establish and finalize the PM measurement allowance for the HDIUT program adopted in 2006 and correct the test procedures to reflect exemptions adopted by the Board in December 2008.

Summary of Section 1956.8(b).

This provision sets forth the test procedures for determining compliance with HDDEs and vehicle standards. The proposed amendment to this provision

updates the date of the “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles” to reflect the proposed amendments to those test procedures.

Rationale for Section 1956.8(b).

This provision is necessary to inform HDDE manufacturers which test procedures they must use to comply with the HDIUT regulations. The amendment to this provision is needed to ensure that HDDE manufacturers are utilizing the most recently adopted “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles.”

X. STAFF RECOMMENDATIONS

The proposed PM measurement allowance used for measuring PM emissions is necessary for the successful implementation of California’s heavy-duty diesel in-use compliance regulations. Specifically, the use of a PM measurement allowance when conducting in-use testing of 2011 and newer HDDEs would allow for an effective and enforceable in-use compliance program for HDDEs and ensure that the PM emission benefits expected from the adopted HDDE emission standards are realized.

Staff therefore recommends that the Board adopt the proposed PM measurement allowance for PM emissions, as set forth in the amendments to section 1956.8, title 13, California Code of Regulations, and the incorporated “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles,” attached hereto as Appendices A and B, respectively.

XI. REFERENCES

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