California Environmental Protection Agency

Air Resources Board

Public Meeting Agenda

LOCATION:
Air Resources Board
Byron Sher Auditorium, Second Floor
1001 I Street
Sacramento, California 95814

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

TO SUBMIT WRITTEN COMMENTS ON AN AGENDA ITEM IN ADVANCE OF THE MEETING GO TO:
http://www.arb.ca.gov/lispub/comm/bclist.php

January 24, 2008
9:00 a.m.

Item #

08-1-1: Health Update: Impact of Mobile Source Emissions on Death Rates in the U.S. Trucking Industry

Staff will present an assessment of the causes of death for about 54,000 Teamsters Union members. The study examined mortality effects by diesel vehicle use and by job type. This analysis of the U.S. trucking industry found an increase in mortality due to lung cancer and heart disease among drivers, compared to other categories, such as clerks and shopworkers. These results are consistent with previous studies showing an association between exposure to vehicle exhaust and an increased risk of death from lung cancer and heart disease.

08-1-2: Public Hearing to Consider Five Research Proposals

1. *"Economic Value of Reducing Cardiovascular Disease Morbidity," RFP No. 07-301, San Diego State University Research Foundation, $392,036.*
2. *"Developing a California Inventory for Selected Applications of Perfluorocarbons, Sulfur Hexafluoride, Hydrofluorocarbons, Nitrogen Trifluoride, Hydrofluoroethers, and Ozone Depleting Substances," Institute for Research and Technical Assistance, $199,840.*
3. *"Development of a California-Specific Intermodal Freight Transport Model," University of Delaware, $199,937.*
4. *"Reducing Emissions of Volatile Organic Compounds from Agricultural Soil Fumigation. Comparing Emission Estimates from Simplified Methodology," United States Department of Agriculture, $150,000.*
5. *"Environmental Justice Saturation Monitoring of Selected Pollutants in Wilmington," Desert Research Institute, $40,223, Augmentation to Contract No. 05-304.*

08-1-3: Report to the Board on ARB's Action Plan for 2008

ARB Executive Officer James Goldstene will brief the Board on major initiatives, rulemakings, and other activities scheduled for 2008.

08-1-4: Public Meeting to Consider the Approval of New Grants under the Innovative Clean Air Technologies (ICAT) Program

In response to a public solicitation of applications, ARB staff has received and reviewed proposals for the quality of their innovative technologies, their potentials for reducing air pollution and for commercial application in California, their potential economic benefits for California, the quality of the proposed demonstration projects, and their values to ARB's programs. ARB staff is recommending grants for three of the proposed projects.

08-1-5: Appointments to Fill Vacancies of the Environmental Justice Advisory Committee (EJAC) under AB 32, the California Global Warming Solutions Act of 2006

EJAC's role is to advise the Board in developing the scoping plan of emission reduction measures and any other pertinent matter during the implementation of AB 32. Staff recommends the Board appoint the recommended committee member and alternate replacements to fill vacancies in EJAC.

08-1-8: Public Hearing to Consider Amendments to the Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines

Staff will propose amendments to the Verification Procedure that would increase the Procedure's flexibility in evaluating the growing complexity and diversity of diesel emission control technologies. The proposed changes would also allow the Procedure to better support the State's in-use fleet regulations through more robust evaluations of control technologies and expedited verifications of viable control technologies. In addition, clarifying language is included to make the Procedure more straightforward for applicants. The amendments include, among other things, verification requirements for control technologies that only reduce NOx emissions, new reduction classifications for NOx reducing technologies, new testing requirements, and conditional extensions for verified technologies.

07-12-10: CONTINUED FROM THE DECEMBER 7, 2007 BOARD MEETING: Public Meeting to Consider Options Regarding the Requested Disclosure of Zero Emission Vehicle (ZEV) Credit Data Based on Submittals by Vehicle Manufacturers Who Have Designated the Data as Confidential Trade Secret Information

The Board will consider a tabled motion to disclose, after 21 days' notice, information compiled by ARB from submittals by vehicle manufacturers of information on their production of ZEVs, partial ZEV allowance vehicles (PZEV) and advanced technology PZEVs, and any exchanges of ZEV credits. This information, which was claimed to be trade secret by all large volume manufacturers, is relevant to the upcoming rulemaking on proposed amendments to the ZEV regulation. Staff will also report on efforts to reach an agreement with manufacturers to disclose information sufficient to assure a transparent rulemaking process.

CLOSED SESSION – LITIGATION

The Board will hold a closed session as authorized by Government Code section 11126(e) to confer with, and receive advice from, its legal counsel regarding the following pending litigation:

Central Valley Chrysler-Jeep, Inc. et al. v. Goldstene, U.S. District Court (E.D. Cal. - Fresno), No. 1:04-CV-06663-AWI-GWA.

Fresno Dodge, Inc. et al. v. California Air Resources Board and Witherspoon, Superior Court of California (Fresno County), Case No. 04CE CG03498.

General Motors Corp. et al. v. California Air Resources Board and Witherspoon, Superior Court of California (Fresno County), No. 05CE CG02787.

Massachusetts v. E.P.A., 127 S.Ct. 1438, 167 L.Ed.2d 248 (April 02, 2007.)

OPPORTUNITY FOR MEMBERS OF THE BOARD TO COMMENT ON MATTERS OF INTEREST.

Board members may identify matters they would like to have noticed for consideration at future meetings and comment on topics of interest; no formal action on these topics will be taken without further notice.

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

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

TO SUBMIT WRITTEN COMMENTS ON AN AGENDA ITEM IN ADVANCE OF THE MEETING GO TO:
http://www.arb.ca.gov/lispub/comm/bclist.php

IF YOU HAVE ANY QUESTIONS,
PLEASE CONTACT THE CLERK OF THE BOARD
1001 I Street, 23rd Floor, Sacramento, CA 95814

(916) 322-5594
FAX: (916) 322-3928
ARB Homepage: www.arb.ca.gov

To request special accommodation or language needs, please contact the following:

- **For individuals with sensory disabilities, this document is available in Braille, large print, audiocassette or computer disk. Please contact ARB's Disability Coordinator at 916-323-4916 by voice or through the California Relay Services at 711, to place your request for disability services.**
- **If you are a person with limited English and would like to request interpreter services to be available at the Board meeting, please contact ARB's Bilingual Manager at 916-323-7053.**

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

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

California Environmental Protection Agency

Air Resources Board

PUBLIC MEETING AGENDA

LOCATION:
Air Resources Board
Byron Sher Auditorium, Second Floor
1001 I Street
Sacramento, California 95814

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January 24, 2008
9:00 a.m.

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CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC MEETING TO CONSIDER THE APPROVAL OF GRANTS UNDER THE INNOVATIVE CLEAN AIR TECHNOLOGIES (ICAT) PROGRAM

DATE: January 24, 2008

TIME: 9:00 a.m.

PLACe: California Environmental Protection Agency
Air Resources Board
Byron Sher Auditorium, Second Floor
1001 I Street
Sacramento, CA 95814

If you have a disability-related accommodation need, please go to http://www.arb.ca.gov/html/ada/ada.htm for assistance or contact the ADA Coordinator at (916) 323-4916. If you are a person who needs assistance in a language other than English, please go to http://inside.arb.ca.gov/as/eeo/languageaccess.htm or contact the Bilingual Coordinator at (916) 324-5049. TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

The Board's ICAT program co-funds demonstrations of new technologies that can improve air quality in California and support ARB programs while helping to stimulate the state's economy. The ARB staff will recommend that the Board approve co-funding for four projects that were received in response to a public solicitation. These projects were selected because they address important ARB program needs, are technically sound, can reduce emissions, and can succeed commercially within a few years. The Board will consider proposed resolutions to approve co-funding for these projects at its meeting.

The ARB staff will provide an oral presentation at the meeting. The projects to be considered are the following:

"SunCache Solar Water Heating System Demonstration," submitted by the Davis Energy Group, for a total amount not to exceed $235,000.

"High Accuracy Mobile Emissions Laboratory," submitted by Los Gatos Research, for a total not to exceed $77,996.

"Field Demonstration of an Advanced Composite Particulate Filter," submitted by Geo2 Technologies, Inc., for an amount not to exceed $185,000.

Interested members of the public may present comments orally or in writing at the meeting and in writing or by email before the meeting. To be considered by the Board,

written submissions not physically submitted at the meeting must be received no later than **12:00 noon, January 23, 2008**, and be addressed to the following.

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: http://www.arb.ca.gov/lispub/comm/bclist.php

Facsimile submittal: (916) 322-3928

The Board requests, but does not require, 30 copies of any written submission. Also, the ARB requests that written and email statements be filed at least ten days prior to the meeting so that ARB staff and Board members have time to fully consider each comment. Further inquiries regarding this matter should be directed to Mr. Bart E. Croes, P.E., Chief, Research Division, P.O. Box 2815, Sacramento, California 95812, (916) 445-0753.

CALIFORNIA AIR RESOURCES BOARD

for James N. Goldstene
Executive Officer

Date: January 11, 2008

TITLE 13. CALIFORNIA AIR RESOURCES BOARD

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

The Air Resources Board (the Board or ARB) will conduct a public hearing at the time and place noted below to consider adoption of amendments to the Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines. The proposed amendments would revise, clarify and make specific requirements that pertain to the process for obtaining the ARB's verification of devices or strategies to control emissions from diesel engines.

DATE: January 24, 2008

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Byron Sher Auditorium
1001 I Street
Sacramento, CA 95814

This item will be considered at a one-day meeting of the Board, which will commence at 9:00 a.m., January 24, 2008. Please consult the agenda for the meeting, which will be available at least 10 days before January 24, 2008, to determine the day on which this item will be considered.

If you have a disability-related accommodation need, please go to http://www.arb.ca.gov/html/ada/ada.htm for assistance or contact the ADA Coordinator at (916) 323-4916. If you are a person who needs assistance in a language other than English, please contact the Bilingual Coordinator at (916) 324-5049. TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed amendments to title 13, California Code of Regulations (CCR), sections 2700, 2701, 2702, 2703, 2704, 2705, 2706, 2708, 2709, and 2710.

Background:

In 1998, ARB identified diesel particulate matter (PM) as a toxic air contaminant (title 17, CCR, section 93000). In 2000, ARB adopted the Diesel Risk Reduction Plan (DRRP) with the goal of reducing PM emissions and their associated health risks by

85 percent by the year 2020. The DRRP identified a number of key measures to achieve this goal: more stringent standards for all new diesel-fueled engines and vehicles, retrofitting in-use diesel engines with diesel emission control systems, and the use of low-sulfur diesel fuel.

To support the DRRP, staff developed a verification procedure (Procedure) for in-use diesel emission control systems (systems) that was adopted by the Board in May 2002. The Procedure is used by staff to ensure that in-use diesel emission control systems achieve real and durable PM emissions reductions. It specifies test procedures, warranty requirements, and in-use compliance testing requirements. Systems that meet all of the Procedure's requirements are verified and thus become candidate compliance options for ARB fleet regulations that require the control of diesel emissions from in-use fleets.

In-use fleet regulations, both adopted by the Board and currently under development, rely on having verified diesel emission control systems available to fleet owners as compliance options. Diesel vehicles and equipment for which regulations have already been adopted include transit buses (title 13, CCR, section 2023, et seq.), solid waste collection vehicles (title 13, CCR, section 2021, et seq.), vehicles that belong to public agencies and utilities (title 13, CCR, section 2022, et seq.), mobile cargo handling equipment at ports and intermodal rail yards (title 13, CCR, section 2479), and transport refrigeration units (title 13, CCR, section 2477). A far-reaching in-use regulation is currently under development to control emissions from private on-road heavy-duty diesel vehicles. These regulations provide several paths to compliance, one of which is the installation of verified diesel emission control systems. To support the successful implementation of these regulations, it is therefore critical for the Procedure to be an effective and efficient means to evaluate diesel emission control systems. However, as the verification program has matured, staff has found that a number of amendments to the Procedure are necessary to better serve the needs of the in-use fleet regulations.

Proposed Amendments:

The proposed regulatory language and explanations can be found in the Staff Report: Initial Statement of Reasons (ISOR) and the attachments thereto. The most significant proposed amendments are summarized below:

Conditional Extensions

Staff proposes amendments that would provide for a conditional extension period during which verified diesel emission control systems may be more quickly deployed for use with a greater range of on-road applications than under the current Procedure. The conditional extension would allow applicants with verified systems to apply to extend their verifications to include additional on-road vehicles by submitting some, but not all of the information and data required by the Procedure. If an applicant is granted a conditional extension, the applicant would then be able to sell the system immediately as conditionally verified and would have one year to formally complete the extension by supplying the rest of the information required by the Procedure. Conditional extensions

would therefore accelerate the verification of proven technologies for additional on-road applications and provide regulated fleet owners with additional compliance options more quickly than can occur under the current Procedure.

Systems that Only Reduce Oxides of Nitrogen (NOx) Emissions

Currently, the Procedure does not apply to systems that are intended to reduce emissions of NOx only. Staff proposes that the scope of the Procedure be broadened to allow for the verification of systems that reduce emissions of NOx, but not PM, for certain diesel engines. This could help to address the need for additional reductions in emissions of NOx from in-use diesel engines.

Testing Requirements for Off-Road Applications and Fuel-Based Strategies

Staff proposes amendments to the Procedure that would require applicants seeking verification of a diesel emission control system intended for use with variable speed off-road applications to perform emission testing using the transient test procedures outlined in title 13, CCR, section 2423 and the incorporated California Exhaust Emissions Standards and Test Procedures for New 2008 and Later Tier 4 Off-Road Compression-Ignition Engines, Part I-C (New 2008 Off-Road Test Procedures). All systems intended for variable speed off-road engines would be required to undergo three hot-start tests using the Nonroad Transient Cycle (NRTC) as prescribed in the above-referenced procedures. The transition to a transient test cycle is important because most off-road engines and equipment have transient duty cycles that are not well characterized by the steady state test cycle currently required. As a result, the current test cycle provides a very limited means for evaluating the performance of many kinds of emission control systems. To assist applicants in the transition to the NRTC, staff proposes that applicants be allowed to continue to use the existing steady-state test procedures outlined in the current ARB off-road regulations until December 31, 2008, provided certain criteria are met.

Staff also proposes that all fuel-based control systems follow the verification procedures specified in section 2710. This will ensure similar emissions testing for all fuel-based strategies and require appropriate testing that ensures real and durable emissions reductions from applications subject to emissions requirements in the fleet rules.

Requirements for NOx Reduction Systems

Staff proposes that NOx reduction systems be verified using five levels, called Marks, defined by the lower bounds of NOx reduction performance. The lower bounds are equally spaced apart in 15 percent increments. Systems that achieve NOx reductions of less than 25 percent would not be verified. This proposal would address the growing need for NOx reductions by providing broadly defined verifications that complement existing technologies.

To assist in the evaluation of the in-use performance of aftertreatment-based NOx emission control systems, staff proposes that NOx emissions both upstream and downstream of the NOx device be measured and recorded during durability and field

demonstrations. These data provide a record of activity as well as insight into the functioning of a system while in actual use.

Staff also proposes that the Board eliminate the requirement to test an on-road NOx emission control system under conditions that generate off-cycle emissions. One fundamental issue with the current requirement is that there is no standard method or test cycle which is guaranteed to trigger off-cycle NOx emissions for all engine makes and models. Staff has had only limited success with emissions test conditions that reliably result in off-cycle emissions. The proposal should reduce verification costs and simplify the overall process.

Other Amendments

Staff proposes that the Board add additional clarifications of the current requirements. These include deadlines for submitting in-use compliance information, a requirement for specific information to be kept for each diesel emission control system sold, a requirement that verified systems actually be sold in California, and specific requirements regarding verification transfers, acceptance of pre-existing data, system labeling, and sales and installation. These proposed amendments will aid applicants by clarifying the intent of existing requirements.

COMPARABLE FEDERAL REGULATIONS

The United States Environmental Protection Agency (U.S. EPA) has published a draft document, "General Verification Protocol for Diesel Exhaust Catalysts, Particulate Filters, and Engine Modification Control Technologies for Highway and Nonroad Use Diesel Engines," but has not promulgated formal regulations for this verification protocol. That verification protocol is intended to support the voluntary retrofit programs initiated by U.S. EPA, while staff's proposal is to support ARB's DRRP and all the associated in-use fleet regulations. Also, the U.S. EPA protocol does not regulate changes in emissions of nitrogen dioxide caused by emission control systems.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

The Board staff has prepared the ISOR for the proposed regulatory action, which includes a summary of the economic and environmental impacts of the proposal. The ISOR is entitled: Proposed Amendments to the Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines.

Copies of the ISOR and the full text of the proposed regulatory language, in underline and strikeout format to allow for comparison with the existing regulations, may be accessed on the ARB website listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, California 95814, (916) 322-2990 at least 45 days prior to the scheduled hearing on January 24, 2008.

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

Inquiries concerning the substance of the proposed regulation may be directed to the designated agency contact persons, Ms. Danielle Robinson, Air Resources Engineer, Retrofit Assessment Section, at (626) 450-6109 or by email at drobinso@arb.ca.gov, or Ms. Shawn Daley, manager, Retrofit Assessment Section, at (626) 575-6972 or by email at sdaley@arb.ca.gov.

Further, the agency representative and designated back-up contact persons to whom non-substantive inquiries concerning the proposed administrative action may be directed are Alexa Malik, Manager, Board Administration & Regulatory Coordination Unit, (916) 322-4011, or Amy Whiting, Regulations Coordinator, (916) 322-6533. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

This notice, the ISOR and all subsequent regulatory documents, including the FSOR, when completed, are available on the ARB Internet site for this rulemaking at www.arb.ca.gov/regact/2008/verdev2008/verdev2008.htm

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

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

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

In developing this regulatory proposal, ARB staff evaluated the potential economic impacts on representative private persons or businesses. In general, ARB is not aware of any cost impacts that a representative private person or business would necessarily incur in reasonable compliance with the proposed action. Participation in the Procedure is purely voluntary, both in its current form and as amended under the proposed action. Presumably, only entities that expect to benefit financially by obtaining verification will do so. While it is true that participation in the verification process is voluntary and there is no prohibition against selling diesel emission control strategies in California that have not been verified by ARB, the Board has adopted and may in the future adopt regulations requiring reductions of PM from in-use diesel vehicles through the application of verified, retrofitted diesel emission control strategies in specific situations.

Entities subject to these retrofit requirements must use verified diesel emission control strategies to comply with these requirements under some compliance options. Consequently, entities that wish to pursue these compliance options will only purchase systems from manufacturers that have obtained ARB's verification. For the most part, the proposed amendments would not raise compliance costs, and in the case of conditional verification may result in cost savings by allowing diesel emission control strategies to be marketed and used before the verification process is completed. Nevertheless, staff is aware of certain cost impacts that a representative private person or business may, and in some cases would, necessarily incur in reasonable compliance with the proposed action, should they elect to do so. These cost impacts are discussed below.

The proposed transient testing requirements for off-road applications would require applicants to perform a test cycle that is different from the steady state cycle they currently conduct. Staff is aware of three laboratories that can perform the proposed test cycle with no increase in cost to applicants. Applicants who wish to test their products at an internal laboratory may incur costs if their testing facility cannot presently perform the proposed test cycle. If their laboratory can currently perform transient testing, staff estimates that applicants would spend $35,000 to $50,000 to install necessary software and hardware. As an alternative, applicants may use their own staff to develop and install software and hardware. Regardless, these facilities will ultimately incur these costs in order to perform NRTC testing for Tier 4 off-road engine certifications. Applicants whose laboratories can only perform steady state testing may spend $250,000 to $3,000,000. Staff estimates that applicants or independent laboratories that wish to build a completely new test cell that can support NRTC testing would spend up to $5,125,000. Staff estimates that a new steady state test cell costs up to $1,200,000. Therefore, applicants could incur up to nearly $4,000,000 in additional costs to build a new test cell that can run the NRTC. In all cases, costs vary greatly depending on the option selected by an applicant, which parties are chosen to do the necessary installations, and what equipment is installed.

Under staff's proposal, applicants with NOx reduction aftertreatment systems would be required to measure NOx emissions upstream and downstream of the aftertreatment systems. Staff estimates that applicants who choose to install NOx sensors upstream and downstream of the aftertreatment system would spend approximately $5,500 for each emissions measurement system. This estimate includes two NOx sensors, one mass air flow sensor, one electronic controller, and one datalogger. Many diesel emission control systems already have some of these components thus reducing these costs. In addition, the proposal eliminates emissions testing of NOx reduction systems under conditions that give rise to significant periods of elevated NOx emissions. This reduction in testing cost should offset the additional costs applicants would incur in complying with the proposed requirement to measure in-use NOx emissions.

Applicants with fuel additive-based systems may incur additional costs to comply with the proposed requirement for fuel-based systems. The proposal requires applicants to conduct additional emissions tests, as required in section 2710. The increased cost for

these additional emissions tests is estimated to be $50,000. Including toxics measurements, the increased cumulative costs are estimated to be up to $150,000. However, the Procedure currently requires additional emissions analysis for systems (including fuel-additive based systems) that may increase toxic air contaminants or other harmful compounds, which can include emissions analysis required in section 2710. As such, the actual estimated cost increases may be significantly less (closer to $50,000).

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

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed regulatory action would not affect the creation or elimination of jobs within the State of California, the creation of new businesses or elimination of existing businesses within the State of California, or the expansion of businesses currently doing business within the State of California. A detailed assessment of the economic impacts of the proposed regulatory action can be found in the ISOR.

The Executive Officer has also determined, pursuant to title 1, CCR, section 4, that the proposed regulatory action would not affect small businesses because the Verification Program is a voluntary program and generally does not affect small businesses. Applicants that can meet the requirements and find verification advantageous choose to participate.

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

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the Board or that has otherwise been identified and brought to the attention of the Board would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action.

SUBMITTAL OF COMMENTS

The public may also present comments relating to this matter orally or in writing at the meeting, and in writing or by email before the meeting. To be considered by the Board, written submissions not physically submitted at the meeting must be received **no later than 12:00 noon, January 23, 2008,** and addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: http://www.arb.ca.gov/lispub/comm/bclist.php

Facsimile submittal: (916) 322-3928

Please note that under the California Public Records Act (Government Code section 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

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

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under that authority granted in Health and Safety Code, sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600, and 43700 of the Health and Safety Code. This action is proposed to implement, interpret and make specific sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, and 43204-43205.5 of the Health and Safety Code and title 17, CCR, section 93000.

HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340) of the Government Code.

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

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

CALIFORNIA AIR RESOURCES BOARD

James Goldstene
Executive Officer

Date: November 20, 2007

State of California
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
AIR RESOURCES BOARD

STAFF REPORT:
INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

PROPOSED AMENDMENTS TO THE VERIFICATION PROCEDURE, WARRANTY AND IN-USE COMPLIANCE REQUIREMENTS FOR IN-USE STRATEGIES TO CONTROL EMISSIONS FROM DIESEL ENGINES

Date of Release: December 7, 2007
Scheduled for Consideration: January 24, 2008

This document has been reviewed by the staff of the California Air Resources Board, and approved for publication. Publication does not signify that the contents necessarily reflect the views and policies for the Air Resources Board.

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EXECUTIVE SUMMARY

In 2000, the Air Resources Board (ARB or Board) adopted the Diesel Risk Reduction Plan (DRRP) following its identification of particulate matter (PM) emissions from diesel engines as a toxic air contaminant. One of the key strategies in the DRRP for mitigating diesel PM emissions is retrofitting in-use diesel engines with diesel emission control systems (DECS). To ensure that DECS achieve real and durable reductions of PM and oxides of nitrogen (NOx) emissions, staff developed the *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines* (the Procedure), which the Board adopted in May 2002. The Procedure is used by staff to evaluate DECS through emissions, durability, and field testing. In addition, it permits further evaluation after installation through warranty and in-use compliance requirements. The Procedure is therefore ARB's key tool for ensuring that DECS used by fleet owners are an effective means to achieving the emission reduction goals of the DRRP.

Staff is proposing amendments to the Procedure which will improve the verification process and better support ARB's in-use fleet rules. The amendments proposed by staff will:

- Allow conditional extensions for verified systems
- Require transient emissions testing for off-road verifications
- Specify requirements for systems that reduce NOx emissions
- Change requirements for fuel additives
- Clarify in-use compliance requirements
- Clarify verification transfer policy

The first three amendments listed above are the most significant changes staff is proposing. Allowing a conditional extension of an existing verification will enable an applicant to bring a proven technology to market as a verified system more quickly. The proposal to require transient emissions testing for off-road verifications that include variable-speed off-road vehicles and equipment is necessary as it will enable more accurate verifications of DECS performance. This is particularly true for the determination of the effect of a DECS on emissions of NOx and nitrogen dioxide (NO_2). The proposed amendments relating to NOx systems will create a classification system of levels based on performance that will allow verifications to cover a broader scope of engines. They will also specify important requirements for selective catalytic reduction (SCR) systems that are necessary to ensure the effectiveness of this key technology in practice.

Staff's proposed amendments do not have a direct, quantifiable emissions benefit, but will enable more accurate quantification of benefits from DECS as well as lower emissions of NO_2. In developing its proposal, staff held four public workshops in Los Angeles, El Monte, and Sacramento that were primarily

attended by DECS manufacturers and installers. Staff also held numerous meetings with the Manufacturers of Emission Controls Association (MECA) and individual companies to further discuss the proposal. Although staff did consider several alternatives to the proposal, staff concluded that the proposed amendments provide the best means of improving the Procedure's ability to support the in-use fleet rules and enable real reductions of PM and NOx emissions and the associated health risks.

The economic impacts of the proposed amendments on the State, affected businesses, and individual fleets are not expected to be significant, as participation in the verification process is voluntary. Applicants that participate choose to do so for financial gain because verification opens up many new markets for their products. The proposed amendments may require some test facilities to alter their infrastructure if they choose to offer testing compliant with verification requirements. For individual fleets subject to ARB's fleet rules, staff's proposal may accelerate the verification process, thereby resulting in additional products being available to meet the requirements of the rules in less time. Historically, increased product offerings and competition for market share among manufacturers has had the effect of lowering unit prices, resulting in a cost benefit to the regulated fleets.

I. INTRODUCTION

This report describes staff's proposed amendments to the *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines* (Procedure), contained in the California Code of Regulations (CCR), title 13, sections 2700-2710. The main purpose of the Procedure is to support the Diesel Risk Reduction Plan (DRRP), which is the strategy adopted by the Air Resources Board (ARB or Board) in 2000 for dramatically reducing Californians' exposure to diesel particulate matter (PM).

The ARB has already adopted various regulations as part of the DRRP that require emissions reductions from in-use fleets of diesel vehicles and equipment. One of the primary paths to compliance with these "fleet rules", as they are commonly known, is for fleet owners to retrofit their engines with diesel emission control systems (DECS) that are verified by ARB under the Procedure. The Verification Program is therefore a critical element of the DRRP. It ensures that the benefits from a verified emission control system are both real and durable. To provide improved support for the fleet rules, staff has determined that the Procedure should be amended. This report describes staff's proposed amendments, the rationale behind them, and their potential impact.

A. DIESEL PM: RISK IDENTIFICATION AND MANAGEMENT

The basis for the development of the DRRP, the fleet rules, and the Procedure was ARB's identification of diesel PM as a toxic air contaminant (TAC)[1] in 1998. It was estimated that about 28,000 tons of diesel PM are emitted from diesel engines each year in California. The pollutant was found to constitute about 70 percent of the total ambient air toxics risk. The scientific assessment estimated diesel PM to be associated with over 500 potential cases of cancer per million people on a statewide average basis, and about 1,000 cases per million in the South Coast Air Basin (Air Resources Board, 2000). In 2001, diesel PM was reported to contribute to, on average, 2,900 premature deaths, 2,600 cases of chronic bronchitis, and 5,300 hospital admissions annually (Lloyd and Cackette, 2001). The significant health risk posed by exposure to diesel PM prompted ARB to make the scope of the DRRP equally significant.

The DRRP includes several far-reaching control measures to reduce diesel emissions from both new and in-use engines. The three main components are:

- Tighter certification emission limits for new diesel-fueled engines and vehicles;

[1] Toxic Air Contaminant – As defined in section 39655 of the Health and Safety Code, "an air pollutant which may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health.". Also see CCR, title 17, section 93000.

- Retrofitting in-use engines in on-road, off-road, and stationary applications with diesel emission control technologies; and

- Reducing the sulfur level in diesel fuel to no more than 15 parts per million to facilitate the use of advanced diesel emission control technologies.

The DRRP envisioned using these measures to achieve the goals it established of reducing emissions of diesel PM and the associated cancer risk by 75 percent in 2010 and by 85 percent in 2020 (Air Resources Board, 2000).

B. ESTABLISHMENT OF THE PROCEDURE AND ITS ROLE IN THE FLEET RULES

After the DRRP was adopted, staff developed and implemented the Procedure to ensure that DECS applied to in-use vehicles and equipment would achieve real and durable PM and NOx emissions reductions. The Procedure specifies testing procedures and requirements that must be followed in order for DECS to be verified in California. The Board approved the Procedure at its May 16, 2002, public meeting and amended it at subsequent public meetings in February, 2004, and March, 2006.

The Procedure plays a vital role in ARB's fleet rules, both adopted and under development, which provide a path towards meeting the goals of the DRRP. Each fleet rule gives fleet owners several compliance options. One compliance option that is used extensively and will continue to be used is retrofitting vehicles and equipment with DECS. For a given emission control system to qualify as a valid compliance option, the fleet rules require that it be verified by ARB under the Procedure. The Procedure is therefore one of the fundamental tools that staff uses to ensure the successful implementation of the fleet rules. Table 1 below summarizes the rules and related programs that currently rely on DECS verified under the Procedure:

Table 1: ARB Regulations and Programs Supported by the Procedure

Regulation/Program	Adoption Date
Fleet Rule for Transit Agencies	February 2000
Solid Waste Collection Vehicle Rule	September 2003
Transport Refrigeration Unit ATCM*	February 2004
ATCM for Stationary Compression Ignition Engines	February 2004
Portable Diesel-Fueled Engines ATCM	February 2004
Regulation for Mobile Cargo Handling Equipment at Ports and Intermodal Rail Yards	December 2005
Fleet Rule for Public Agencies and Utilities	December 2005
In-Use Off-Road Diesel Vehicle Regulation	July 2007
On-Road Heavy-Duty Diesel Vehicles Regulation	under development
Intermodal Truck Rule (Port Trucks)	under development
Carl Moyer Memorial Air Quality Standards Attainment Program	n/a
Lower Emission School Bus Program	n/a

*ATCM = Airborne Toxic Control Measure

The Verification Program is an integral part of the ARB fleet rules. To support successful implementation of these rules, it is critical that the Procedure enable staff to efficiently and effectively evaluate DECS, and that the program be structured such that verified systems can enter the marketplace in an expeditious manner.

Over the course of implementation and enforcement of the fleet rules, several aspects of the Procedure have shown a need for improvement. Staff is proposing amendments to the Procedure to address these deficiencies, while proposing additional changes to ensure that verified systems remain available to support the fleet rules. The amendments proposed by staff include:

- Conditional extensions of existing verifications
- New test requirements for transient off-road applications
- Additional requirements for in-use compliance testing
- New classifications for NOx emissions reductions
- Additional requirements for fuel additives and NOx reduction systems

Staff's proposal also clarifies several requirements already implied (but not explicitly stated) within the Procedure. Staff believes that these amendments will improve the enforceability of the Procedure while enabling more systems to be verified in a way that ensures their effectiveness in reducing emissions.

C. PROGRAMS SUPPORTING THE VERIFICATION PROGRAM

Currently two demonstration projects are in development to promote DECS that will be candidates for verification for off-road vehicles and equipment. The Off-Road Diesel Construction Equipment Retrofit Demonstration Program (Showcase) is a multi-agency project between the Air Resources Board, the South Coast Air Quality Management District (SCAQMD), and the Mobile Source Air Pollution Reduction Review Committee (MSRC) designed to encourage manufacturers of qualifying DECS to participate with construction equipment fleet owners in retrofitting their engines to reduce diesel particulate matter (PM) or diesel PM plus oxides of nitrogen (NO_x). The goal of the Showcase is to demonstrate the viability of new DECS on various off-road applications and provide DECS that will ultimately be evaluated under the Procedure as compliance options for off-road fleet owners before the recently adopted in-use off-road diesel vehicle regulation takes effect. Sixteen manufacturers of 30 DECS, comprised of active and passive diesel particulate filters (DPF) systems, will participate. Eight of these DECS include selective catalytic reduction (SCR) systems, and seven are DPF systems utilizing fuel borne catalysts. The proposed systems will be demonstrated on 245 pieces of construction equipment operating within the South Coast Air Basin that belong to six public fleets and 14 private fleets. Nearly $4.9 million dollars in funding has been approved for allocation to fleet owners for the purchase of qualifying DECS. MSRC is in the process of initiating contractual agreements with the fleet owners. Installation and monitoring of the DECS is anticipated to begin in early 2008.

Currently, another off-road demonstration program is also being developed to demonstrate DECS that will be candidates for verification. It is anticipated that many DECS manufacturers that participate in the Showcase project will also participate in this demonstration. In conjunction with the United States Environmental Protection Agency (U.S. EPA), Supplement Environmental Projects (SEP) funds in the amount of $700,000 will be provided to support the demonstration. SEP is an environmentally beneficial project which a violator voluntarily agrees to perform as part of a settlement of an enforcement action. In return, U.S. EPA agrees to reduce the monetary penalty that would otherwise apply as a result of the violation(s). Through the SEP, funding to fleet owners can be provided to mitigate the cost of installing verified DECS. Funds may also be used to reduce the cost of testing for DECS manufacturers.

II. RECOMMENDATION

The proposed amendments to the Procedure, as described herein, will help ARB in its efforts to implement the Diesel Risk Reduction Plan and better protect public health. Verified control systems are one of the principal choices end users have to comply with ARB fleet rules. Therefore, the Verification Program strongly affects the success of many ARB regulations. The proposed amendments will strengthen the Procedure through more accurate and efficient assessment of PM and NOx control systems and their emission reduction effectiveness in the real world.

Staff recommends that the Board adopt the proposed amendments to sections 2700, 2701, 2702, 2703, 2704, 2705, 2706, 2708, 2709, and 2710, title 13, of the California Code of Regulations, as set forth in the proposed Regulation Order in Appendix A.

III. OVERVIEW OF THE VERIFICATION PROGRAM

This chapter describes ARB's Verification Program and other verification programs for systems to be used outside of California.

A. DESCRIPTION OF THE VERIFICATION PROCESS

The verification process, as defined by the Procedure, is the means employed by staff to ensure that DECS used to satisfy fleet rule requirements actually achieve the emissions reductions that are required. A manufacturer seeking to verify its product must satisfy emissions testing and warranty requirements up front, and subsequently complete in-use compliance testing with a number of production units retrieved from end users. A description of the types of DECS verified in California is provided in Appendix B.

To initiate the verification process, an applicant first submits preliminary information describing how its product works and the details of the verification test plan it proposes to follow. In this initial stage, staff is careful to evaluate the strengths and weaknesses of the technology, whether the proposed testing and test engine will enable a meaningful evaluation of the product's performance and durability, and the appropriateness of any alternative test methods or procedures that the applicant requests to use. Designing an appropriate test plan is a critical step in the verification process because the results are used to represent the performance of the product over a typically wide range of engine makes and models as well as applications. Shortcomings in test plan design can lead to exaggeration of emissions benefits, undetected secondary emissions with adverse health effects, and countless problems in the marketplace.

Once the preliminary information and test plan have been reviewed and approved, the applicant can begin testing. However, in practice, applicants often conduct unapproved testing and request that ARB consider the resulting data. Staff always reviews existing data and assesses to what extent they satisfy the requirements of the Procedure. That review, in particular when the data were generated using alternative test methods or procedures, slows the verification process, but it is part of the Procedure's flexibility and can potentially help the applicant to obtain verification in a more cost-effective manner.

Two key requirements in the verification process are emissions testing and a durability demonstration. The applicant must procure the services of a test facility (either a contract laboratory or in-house laboratory) that is capable of conducting the required emissions testing on both a new and aged unit. The aged unit is removed from the vehicle or piece of equipment following the durability demonstration. The required durability periods are shown in Table 2 below.

Table 2: Minimum Durability Demonstration Periods

Engine Type	Minimum Durability Demonstration Period
On-Road	50,000 miles or 1000 hours
Off-Road (including portable engines) and Stationary	1000 hours
Stationary Emergency Standby Engines	500 hours

If the aged unit performs as well as the new unit, staff has an indication that the product is well-made and compatible with the kinds of applications for which the applicant seeks verification.

Following completion of all testing, the applicant must submit a final application for staff's review. In addition to the test results, the final application must include:

- Discussion on principles of operation
- Discussion on compatibility with the various engines and applications to be included in the verification
- Explanation of potential safety issues
- Installation and maintenance requirements
- Fuel requirements
- Evaluative comments from a third party
- Raw data
- Quality assurance and control information
- Sample label
- Owner's manual with the warranty statement

The list above is indicative of the multitude of aspects that must be considered before a product can be verified. If staff is convinced that a product has met the requirements of verification, the applicant is issued an Executive Order which declares the product to be verified and specifies the terms and conditions of the verification. The product is then a candidate compliance option for the various fleet rules and programs that require verified systems.

Following verification, one of the on-going responsibilities of the applicant is to submit annual warranty reports to ARB. The warranty report informs staff of annual production and sales of systems in California and provides a summary of warranty claims. The summary includes a description of the nature of the claims and what actions were taken by the applicant to address them. The warranty reporting requirement provides a basic check as to the success of a verified product in California in terms of sales and performance.

After a system is verified and 50 units have been sold into the marketplace, the applicant is subject to in-use compliance testing requirements. ARB needs assurance that actual production units sold in California are performing in a manner consistent with the test units that were used to support the initial verification. To that end, the applicant must retrieve units from the end-users at two different stages of use and have them tested. Four units must be tested at each stage (more if there are failures). Failure of a system to perform consistent with its verification can lead to a lowering of the verified level of performance or revocation of the verification all together.

The verification process is a careful investigation into emission control systems that ARB relies on to protect the health of Californians. Because of the importance of this function and the many complex variables involved, there are many requirements for applicants to fulfill. Verification is by no means an easy task for either the applicant or ARB to perform, but it is necessary to ensure an effective reduction in the health risk posed by emissions from diesel engines. A list of devices currently verified in California is provided in Appendix C.

B. OTHER VERIFICATION PROGRAMS

Another well-known program that evaluates and verifies DECS is the United States Environmental Protection Agency's (U.S. EPA) Voluntary Retrofit Program (VDRP). It is a voluntary program designed to encourage owners of fleets of diesel powered vehicles and equipment to retrofit their engines with DECS. The VDRP evaluates diesel emission reduction technology through emissions and durability testing. Verified technologies are listed in the VDRP Verified Technology List which can be found at http://www.epa.gov/otaq/retrofit/verif-list.htm. After receiving verification, applicants are still responsible for meeting warranty and in-use compliance requirements.

In addition, there is a testing procedure used to evaluate diesel emissions reduction technology called Verminderung der Emissionen von Realmaschinen im Tunnelbau (VERT). It is a testing procedure required by the Swiss Agency for the Environment, Forests, and Landscape (SAEFL) and the Swiss occupational health agency (SUVA) to evaluate control technologies sold and used in underground workplaces, construction sites, and road vehicles in Switzerland. VERT requires at least 90 percent reduction in elemental carbon mass and at

least 95 percent reduction in particle count. Staff has received data used to support verification under both of these programs.

IV. PROPOSED CONDITIONAL EXTENSION AMENDMENT

This chapter presents staff's proposed conditional extension amendment and discusses how it would benefit the Verification Program.

A. CURRENT REQUIREMENTS FOR CONDITIONAL VERIFICATIONS

The Procedure requires staff to evaluate diesel emission control systems through emissions, durability, and field testing. Currently, the Procedure provides for conditional verifications for diesel emission control systems intended for off-road and stationary applications only. There are no provisions for on-road conditional verifications.

Conditional verification allows applicants to market their products as ARB verified prior to receiving full verification. This is accomplished by allowing applicants to complete one-third of the required minimum durability demonstration period. Since the durability demonstration period for off-road and stationary applications generally takes longer than for on-road applications, the conditional verification element of the Procedure allows applicants to sell their products in the off-road and stationary markets for a limited time while concurrently compiling all the data and information needed to attain a full verification. During this period, the conditionally verified diesel emission control systems are treated as fully verified systems for compliance with ARB's fleet rules, and applicants are responsible for meeting all warranty and in-use compliance requirements. Conditional verifications were developed and implemented to ensure that a sufficient number of diesel emission control systems would be available to end-users to comply with the requirements of the fleet rules.

B. DESCRIPTION OF THE PROPOSAL

Staff proposes amending the Procedure allowing for conditional extensions for new on-road applications. Applicants would be able to apply for new conditional on-road extensions for their systems already verified for on-road, off-road, and stationary applications. Applicants that qualify to receive conditional extensions would be able to sell their products as verified systems for one year and concurrently generate data and information needed to receive full verification. In granting a conditional extension, the Executive Officer would consider all relevant information including, but not limited to, the following: the design of the diesel emission control system, original test data, other relevant test data, the duty cycle of the prospective emission control group, and field experience. For the effective time period, the conditional extension would be considered equivalent to a full verification and would allow these systems to be viable solutions for compliance with the fleet rules.

Staff is not proposing that diesel emission control systems that have a conditional verification for off-road and stationary applications be eligible for a conditional extension. Staff believes that conditional extensions should only be based on systems that have been thoroughly tested. As such, diesel emission control systems need to receive full verification before receiving extensions or conditional extensions. This ensures that a conditionally extended technology is achieving real and durable emissions reductions before expanding the verification to include more applications.

V. PROPOSED AMENDMENTS TO TESTING REQUIREMENTS

This chapter describes staff's proposed amendments regarding testing requirements for fuel-based DECS, DECS intended for applications that do not operate on CCR compliant fuels, and DECS intended for off-road applications. It also addresses proposed amendments to NO_2 pre-conditioning requirements and proposed durability requirements for the monitoring and functionality systems of DECS. The need for such modifications to the Procedure is also discussed.

A. REQUIREMENTS FOR FUEL-BASED STRATEGIES

1. Background

The Procedure provides for the verification of fuel-based diesel emission reduction systems, which can typically be categorized as fuel additive-based and alternative diesel fuels. The Procedure defines an alternative diesel fuel as "any fuel used in diesel engines that is not commonly or commercially known, sold or represented as diesel fuel No. 1-D or No. 2-D, pursuant to the specifications in ASTM Standard Specification for Diesel Fuel Oils D975-81, and does not require engine or fuel system modifications for the engine to operate". They include, but are not limited to, biodiesel, Fischer Tropsch fuels, and emulsions of water in diesel fuel. Fuel additives are treated as alternative diesel fuels unless they are supplied to the vehicle or engine fuel by an on-board dosing mechanism, or if they are directly mixed into the base fuel inside the fuel tank of the vehicle or engine, or if they are not mixed with the base fuel until vehicle or engine fueling commences, and no more additive plus base fuel combination is mixed than required for a single fueling of a single engine or vehicle.

Under the Procedure, all fuel-based control systems must undergo a more comprehensive evaluation than other control systems that rely on emissions reductions through hardware alone (e.g., diesel particulate filters, diesel oxidation catalysts, etc). However, this testing is not consistent for alternative diesel fuels relative to fuel additive-based systems. Currently, applicants with fuel additive systems are required to meet requirements of sections 2700-2709. They must use the fuel-based control systems with level 3 diesel particulate filters unless they can be proven, to the satisfaction of the Executive Officer, to be safe for use alone. In addition, applicants must provide the exact chemical formulation, toxicological, epidemiological, and other health-related data regarding the fuel additive every two years. In addition to conducting emissions tests appropriate for the intended applications per section 2703, applicants with fuel additives must also conduct emissions tests using a high concentration of the fuel additives (known as "overdosing"). Also, any fuel additives must be in compliance with applicable federal, state, and local government requirements including registration with the U.S. EPA. Fuel additives must also be evaluated through the multimedia process as required in Health and Safety Code section 43830.8, which includes evaluations from all divisions within the California Environmental

Protection Agency. The Executive Officer may also request additional analyses if there is reason to believe the fuel additive based system will increase TACs, other harmful compounds, or change the nature or amount of emitted PM.

In contrast, applicants with alternative diesel fuels must also meet the requirements of section 2710. They must better characterize properties of the fuel, including aromatic content, American Petroleum Institute (API) gravity, and distillation temperature. Also, additional emissions testing relative to non-fuel based systems is required for alternative diesel fuels using the Federal Test Procedure (FTP) Heavy-Duty Transient Cycle, in accordance with the provisions in the Code of Federal Regulations, Title 40, Part 86, Subpart N. If applicants conduct cold and hot start tests, they must run at least 10 exhaust emissions tests following a specific test sequence. If they only conduct hot start exhaust emissions test, at least 40 tests must be conducted following a specific test sequence. To keep the emissions test cycles similar for all DECS intended for off-road and stationary applications, alternative diesel fuels intended for off-road and stationary applications should be tested under the appropriate test cycles specified in section 2703(e). The appropriate emissions test cycles will help ensure real and durable emissions reductions from applications subject to emissions requirements in the fleet rules.

2. A Description of the Proposal

Staff proposes to more uniformly evaluate all fuel-based control systems by requiring that all fuel-based control systems follow the verification procedures specified in section 2710. Fuel additive-based systems would still be required to perform the additional overdosing testing requirements specified in section 2706(c). In addition, staff proposes that the emissions testing for all fuel based systems follow the emissions test cycles prescribed in Section 2703. As such, systems intended for on-road applications would be tested with an engine dynamometer using the FTP Heavy-duty Transient Cycle compliant with the Code of Federal Regulations, Title 40, Part 86, Subpart N. Control technologies intended for off-road and stationary applications would be tested with engine dynamometers using the appropriate steady state and discrete mode test procedures outlined in the ARB off-road rule regulations given in sections 2703(e)(2) and 2703(e)(3).

B. ALLOWANCE FOR THE USE OF NON-COMPLYING FUELS

1. Background

The Procedure currently requires that all test fuels used for emissions and durability testing meet the specifications in title 13, CCR, sections 2280 through 2283, (typically known as the ARB Reformulated Diesel Fuel Regulations). However, as the scope of the Verification Program has expanded, several

stakeholders have commented that there are some applications that routinely use commercially available fuels that do not meet these specifications. One such example is marine vessels. The main engines of many ocean going vessels are designed to operate on either heavy fuel oil (HFO) or marine diesel oil (MDO). Neither HFO nor MDO meet the specifications currently required by the Procedure for emissions or durability test fuels. Emissions testing performed using a fuel not normally used during actual in-use operation may not be feasible and would likely yield results that are not representative of real-world activities. In addition, in the case of marine vessels, durability testing with fuels other than HFO or MDO would not provide staff with appropriate data to demonstrate that the diesel emission control system would achieve real and lasting emission reductions.

2. Description of Proposal

Staff proposes modifying the Procedure to allow the use of test fuels that do not meet the ARB Reformulated Diesel Fuel specifications of title 13, CCR, sections 2280 through 2283 for both emissions and durability testing in select applications. Approval of the Executive Officer would be required before the use of such fuels is permitted. The use of such fuels would only be allowed if it can be determined that the fuel is representative of commercially available fuel typically used for the intended application.

C. OFF-ROAD TESTING REQUIREMENTS

1. Background

The Procedure currently requires all applicants seeking verification of a DECS intended for use with off-road applications to follow the steady state test procedures outlined in title 13, CCR, section 2423 and the incorporated California Exhaust Emission Standards and Test Procedures for New 2000 and Later Off-Road Compression-Ignition Engines, Part I-B. Using an engine dynamometer, a test engine is operated to follow the International Organization for Standardization (ISO) 8178 C1 test cycle while the exhaust emissions are measured and quantified. The C1 test cycle is an 8-mode test, and includes operation of the engine at specified engine loads (torque) and specified engine speeds. Off-road applicants are required to perform three repetitions using this test cycle in three configurations: a baseline test with no DECS installed, a "pre-conditioned" test with a new DECS installed, and an "aged" test with a service accumulated DECS installed.

Unlike the on-road test cycles, the C1 test cycle does not represent engine operation under dynamic or changing conditions such as those seen in actual, in-use operation. The test engine is brought up to the required speed and torque and allowed to stabilize for a period of time. Once the test engine is stabilized,

the emissions are measured and quantified before moving to the next mode where the process is repeated. Once the emissions from all modes are quantified they are weighted according to a predetermined set of weighting factors. While the modes of the test cycle vary from one-hundred percent torque at rated speed to zero torque at low idle speed, this test cycle is not representative of actual in-use activity for the majority of the engines and equipment in the off-road category. Staff has determined that the majority of off-road engines and equipment have duty cycles that are significantly more transient in nature. Therefore, a test cycle that characterizes actual in-use operation is necessary to accurately determine the effectiveness of a DECS submitted for off-road verification.

The U.S. EPA recently addressed this issue in its determination that effective in-use control of emissions from off-road diesel engines requires a test cycle that more accurately characterizes the transient nature of this diverse category. Working with affected stakeholders such as the Engine Manufacturers Association (EMA) and Southwest Research Institute, U.S. EPA measured and recorded actual speed and load data from off-road equipment while in use. Each piece of equipment measured represented the top tier of off-road equipment as defined by their contribution to U.S. EPA's nonroad (off-road) diesel inventory. Data segments from the unique duty cycles of each off-road application were linked together to construct the Nonroad Compression-Ignition Composite Transient Cycle (NRTC). In May 2004, U.S. EPA released a final regulatory analysis to document the process and methodology used to develop the NRTC (U.S. EPA, 2004). This document provides an in-depth analysis of the technical feasibility of the NRTC and its applicability to equipment and engines in the off-road category. The U.S. EPA adopted the NRTC for variable speed engine certification as part of their new Tier 4 emission standards for nonroad diesel engines.

Similarly, in October 2005, ARB adopted the California Exhaust Emission Standards and Test Procedures for New 2008 and Later Tier 4 Off-Road Compression-Ignition Engines, Part I-C. This document incorporates the relevant sections of Code of Federal Regulations, Title 40, and requires manufacturers of new 2008 and later variable speed off-road diesel engines seeking certification for sale in California to perform emissions testing using the NRTC. In addition, the test procedures include several steady-state test cycles for engines manufactured specifically for off-road applications that do not have a duty cycle that is transient in nature. An example of this might include compression-ignition engines manufactured specifically for use in stationary applications, such as generator sets and agricultural pumps.

2. Description of Proposal

Since its adoption, staff has continually aligned the emissions testing requirements of the Procedure with those of ARB's engine certification programs

where practicable. This provides applicants and staff with access to current and future certification test cycles and procedures and ensures that emissions test facilities will be available to perform the necessary testing required by the Procedure. Since staff has determined that real-world activities for the majority of off-road equipment are not accurately characterized by steady-state test cycles, staff proposes modifying the Procedure to require applicants seeking verification of a DECS intended for use with variable speed off-road applications to perform emissions testing using the transient test procedures outlined in the title 13, CCR, section 2423 and the incorporated California Exhaust Emissions Standards and Test Procedures for New 2008 and Later Tier 4 Off-Road Compression-Ignition Engines, Part I-C (New 2008 Off-Road Test Procedures). All variable speed engines would be required to perform a minimum of three hot-start tests using the NRTC.

Though the New 2008 Off-Road Test Procedures requires both a cold-start and a hot-start test using the NRTC, staff is proposing to eliminate the cold-start portion of the test procedure. Stakeholders have commented that the cold-start test is overly burdensome, significantly lengthens their set-up time, and is weighted such that it contributes very little to the overall transient emissions results. Off-road engines and equipment are started and warmed to a point of stable, hot operation generally once per day. While these conditions could occur at other times, such as after a mid-day break, these types of engines and equipment experience cold-starts significantly less often than their on-road counterparts. In addition, the New 2008 Off-Road Test Procedures weights the cold-start portion of the transient emissions to only five-percent of the overall emissions test results. Therefore, staff agrees with stakeholders and is proposing that applicants be required to perform three test repetitions of the hot-start tests using the NRTC to satisfy the test requirements of the Procedure.

To assist applicants in the transition to the NRTC, staff is proposing a phase-in period which would allow applicants to continue to use the steady-state test procedures outlined in the current ARB off-road regulations (title 13, CCR, section 2423 and the incorporated California Exhaust Emission Standards and Test Procedures for New 2000 and Later Tier 1, Tier 2, And Tier 3 Off-Road Compression-Ignition Engines, Part I-B) until December 31, 2008, provided certain criteria are met.

In order to qualify to use the steady-state test procedures, an applicant must submit a completed preliminary verification application, including a testing proposal, to ARB by October 1, 2008. In addition, the applicant must receive a letter of notification from the Executive Officer dated no later than December 31, 2008, confirming that the preliminary verification application is complete. If approved, an applicant may perform their verification emissions testing using the steady-state test procedures provided that they complete their emissions testing and submit their final verification application no later than

July 1, 2010, and they adhere to the terms and conditions stated in the approved preliminary verification application. Failure to submit their final verification application by July 1, 2010, or to adhere to the terms and conditions stated in the approved preliminary verification application would require emissions testing using the NRTC and the New 2008 Off-Road Test Procedures.

In addition, applicants electing to use the steady-state procedures during the transition period resulting in the verification of their DECS after October 19, 2007, would be required to submit to the Executive Officer additional transient emission test data supporting the continued verification of the DECS by January 1, 2013, or have their verification revoked. The additional transient emissions test data must consist of a new baseline test, a pre-conditioned DECS test, and an aged DECS test using the New 2008 Off-Road Test Procedures. Verifications awarded prior to October 19, 2007 are not subject to this requirement. Table 3 below lists the proposed compliance dates.

Table 3: Proposed Requirements and Dates for Off-Road Verification

Applicants	Proposed Requirement	Compliance Date
Applicants using NRTC	Test emissions reductions using NRTC	NA
Applicants using ISO 8178 C1 test	Submit complete preliminary verification application	October 1, 2008
	Receive letter of notification from Executive Officer	December 31, 2008
	Submit complete final verification	July 1, 2010
	Submit test data using NRTC (for applicants verified after October 19, 2007)	January 1, 2013

Included in staff's recommendation is additional language that would provide the Executive Officer with the authority to allow applicants to use another test cycle if it is determined to be more representative of the engine's or equipment's actual in-use duty cycle. For example, DECS intended for use with auxiliary power units (APU) are currently being processed under the off-road engines and equipment section of the Procedure. However, the duty cycle of an APU is not accurately characterized by a transient test cycle. This language will allow staff to work with applicants to determine the most appropriate test cycle for the

application and ensure that the transient test cycle is only applied where appropriate.

D. NO_2 PRE-CONDITIONING REQUIREMENTS

1. Background

Many diesel emission control systems, in particular catalyzed DPFs, increase the amount of NO_2 in the exhaust to burn off soot that has collected in the filter. Because NO_2 has adverse health impacts arising from direct exposure as well as from its role in the formation of ozone and secondary particulate matter, the Procedure includes a limit on emissions of NO_2. These limits are shown in Table 4 below. To support these emissions limits, the Procedure is complemented by special test unit preconditioning requirements because the amount of NO_2 emitted by a system over an emissions test is sensitive to the state of system at the time of testing (ARB, 2006). These requirements apply to both the degreened and aged test units as well as units retrieved from the field for in-use compliance testing.

Table 4: Current NO_2 Emissions Limits for DECS

Date	NO_2 Emissions Limit (percent increase from baseline NOx emission level)
January 1, 2007	No more than 30 percent
January 1, 2009	No more than 20 percent

For the aged test unit, preconditioning is required only if the backpressure is greater than 30 percent higher than that of the degreened unit. Backpressure is used as a relative indicator for the amount of soot and ash in a system, both of which can suppress NO_2 emissions during testing. If the backpressure exceeds the 30 percent threshold, the aged system must be cleaned as necessary.

Subsequent to adoption of the preconditioning requirements in March 2006, staff found that the preconditioning criterion for the aged test unit, though simple and straightforward to implement, does not treat different systems on an equal basis. The Procedure is used to verify a wide range of diesel emission control systems that vary in their complexity and size. Systems ranging from a simple DPF with one component in the exhaust stream to a multi-component system with various catalysts, static mixers, and a DPF, are all subject to the same preconditioning

requirements. Under the same test conditions, a multi-component system will have a higher initial backpressure than a simpler system, and therefore the aged unit from the multi-component system would have a proportionally greater allowable increase in backpressure. For instance, a simple DPF that averages 8 inches of water (inH_2O) backpressure over the test cycle when degreened could not exceed 10.4 inH_2O when aged. A multi-component system that averages 10 inH_2O when degreened could not exceed 13 inH_2O when aged, which represents a 25 percent greater allowable increase relative to the former system. This can confer an advantage to the multi-component system because all of the backpressure increase is likely to occur in the DPF portion alone. The DPF can thus have more accumulated soot and/or ash than the DPF in the single-component system, and thereby resulting in suppressed NO_2 emissions.

2. Description of the Proposal

Staff proposes to add an alternative backpressure criterion to determine whether the aged test unit needs to be preconditioned. In addition to the current 30 percent maximum backpressure increase, staff proposes that an applicant have the option of complying with an absolute backpressure limit of 60 inH_2O. This alternative criterion is independent of diesel emission control system design and applies equally to all systems. Staff expects that this criterion will be used by smaller, simpler systems for which a backpressure increase of 30 percent can be quite small in absolute terms.

The proposed alternative backpressure criterion would be implemented differently depending on the nature of the verification test cycle. For transient cycles, the limit would be 60 inH_2O for 2 percent of the time. That is, no more than 2 percent of all the 1 Hertz (Hz) backpressure data may exceed 60 inH_2O. For steady-state cycles, the limit would simply be a cap of 60 inH_2O. Steady-state cycles are composed of modes, and so the backpressure recorded for each mode must be less than or equal to 60 inH_2O.

Staff selected 60 inH_20 for the absolute backpressure limit after reviewing DECS manufacturer backpressure warning thresholds and actual backpressure data for a variety of systems. The criterion of not exceeding 60 inH_2O for more than 2 percent of the time is below the first-stage backpressure warning thresholds used by the eight different DPF systems staff reviewed. The two systems with the lowest thresholds also use 60 inH_2O, but the criterion is for over 30 seconds continuously, which represents a significantly higher limit for transient test cycles. Actual backpressures recorded during emissions testing and in-use demonstrations of various systems show that some systems exceeded the proposed criterion and some did not. The proposed criterion therefore appears to be sufficient to prevent emissions testing of systems that are excessively loaded with soot or ash.

E. MONITORING AND NOTIFICATION SYSTEM FUNCTIONALITY REQUIREMENTS

1. Background

The Procedure currently requires applicants to verify their products as a complete system. For example, the Procedure requires all filter-based DECS be installed with a backpressure monitor and a means of notifying the operator when a high backpressure condition exists. Therefore, an applicant with a filter-based DECS would be required to develop a durability test plan that addresses not only the filter, but the backpressure monitoring system and driver notification system as well. However, as the scope of the Verification Program expands to include strategies such as SCR, applicants will likely develop products with increasingly more complex monitoring and notification systems. These systems may include items such as reductant level monitoring systems, operator inducement systems, and mechanisms to de-rate an engine's maximum power output. Staff is concerned that the language currently in the Procedure does not specifically address durability or functional testing of such systems.

2. Description of Proposal

Staff proposes adding clarifying language to the Procedure requiring applicants to demonstrate the durability of all monitoring and notification systems. Applicants would be required to demonstrate the durability and proper operation of such systems through functional testing following service accumulation. Applicants must develop and submit as part of their durability demonstration specific test procedures designed to validate the proper and continued operation of all monitoring and notification systems. Functional testing would be performed following the service accumulation period and the results reported with their final verification application. Successful operation of a complex DECS such as SCR is dependant upon the proper and continued operation of its monitoring and operator notification systems. Furthermore, certain driver inducements such as engine de-rate may not be triggered during the service accumulation period of a durability demonstration. Functional testing of such systems will validate that they perform as intended and ensure that the verified DECS provides continued emissions reductions. The additional language will provide clarity to applicants and allow them to develop and submit for review and approval test procedures designed to demonstrate the durability and functionality of their monitoring and notification systems.

VI. PROPOSED NOx CHANGES

Historically, the Procedure's primary purpose has been to evaluate diesel PM emissions reductions from DECS. However, given California's persistent ozone and secondary PM air quality challenges, staff also recognized that there was a need to be able to verify reductions of NOx emissions, should a system have that functionality. The Procedure, therefore, has provisions that provide for verification of NOx reductions. Because the regulatory need for NOx reductions from in-use vehicles and equipment has become increasingly important in recent times, staff revisited the Procedure to improve its ability to evaluate NOx systems, as well as broaden the scope of systems it can be used to evaluate.

A. REQUIREMENTS FOR NOx ONLY REDUCTION SYSTEMS

1. Current Provisions For Verifying NOx Reductions

The Procedure was created to support the DRRP by providing a means to ensure that diesel emission control systems used to satisfy in-use fleet rule requirements achieve real and durable reductions in emissions of diesel PM. As a result, one of the basic requirements for verification under the Procedure is that a system must reduce PM emissions. A system that only achieves NOx reductions (a "NOx-only" system) is not currently a candidate for verification.

Because diesel engines represent a significant source of NOx emissions in the state, there is now an urgent need to achieve additional reductions in emissions of NOx from in-use diesel engines. This is because NOx is a precursor to both fine particulate matter (PM 2.5) and ozone, and many areas of the state do not meet clean air standards for one or both of these pollutants. While the Procedure can currently help to meet this demand through the verification of systems that reduce emissions of both PM and NOx, it cannot be used to provide NOx-only controls for diesel engines.

2. Description of Proposal

Staff proposes to broaden the scope of the Procedure to allow for the verification of systems that reduce emissions of NOx, but not PM, for certain diesel engines. Specifically, such NOx-only systems could be used with on-road diesel engines certified to a PM emissions standard of 0.01 grams per brake horsepower-hour (g/bhp-hr) or less (typically 2007 and later model year engines), or off-road diesel engines certified to a PM emissions standard of 0.03 g/bhp-hr or less (typically Tier 4 engines over 25 horsepower). Many of these engines will come with DPFs as original equipment. Staff proposes to allow verification of NOx-only systems with additional engines provided that they are not regulated by ARB in-use fleet regulations or Airborne Toxic Control Measures that require PM emissions control, or provided that they would otherwise potentially not be retrofit with PM

emission control systems. The intention of this requirement is to avoid circumstances in which a diesel engine is retrofit with a NOx-only system that then preempts the subsequent use of a PM control system.

Without this provision, verifying NOx-only systems could create a potential for having an engine retrofitted with two different emission control systems: one for NOx control, the other for PM control. The in-use fleet rules, both adopted and under development, will prompt widespread retrofitting of diesel engines with emission control systems that can reduce emissions of PM and systems that can reduce emissions of both PM and NOx. It is conceivable, that without this provision, a given diesel engine could be retrofitted once with a PM control system and then later retrofitted again with a NOx-only system.

The primary issue with such a situation is the compatibility of the two systems. Both systems being verified for use with the same diesel engine is not equivalent to being verified for use with each other. For example, a selective catalytic reduction (SCR) system, which is a high level NOx reduction system, installed upstream of a pre-existing passively-regenerating diesel particulate filter would likely cause the filter to fail for lack of the NOx emissions that it needs to regenerate. To avoid such problems as well as a host of more subtle ones, the Procedure requires that a system composed of multiple components be tested and submitted for evaluation as one system.

Another key issue with having more than one system retrofitted onto a diesel engine is that the warranty claim resolution process would become more complicated. An end-user could be forced to potentially deal with two retrofit manufacturers and the engine manufacturer when trying to resolve a problem that arises with one of the systems. The likelihood of all manufacturers involved having a complete understanding of the other manufacturers' systems and the nature of interactions among all of the components is quite low. Consequently, it could be exceedingly difficult for an end-user to get a prompt and clear resolution to a warranty claim.

Staff also proposes adding general clarifying language that states that a verified diesel emission control system may not be installed on an engine with another diesel emission control system that is not included in the Executive Order. Currently, Executive Orders issued by ARB already have language to that effect, but staff believes it is necessary to reinforce this policy more explicitly in the Procedure.

B. NEW NOx REDUCTION CLASSIFICATIONS

1. Background

A fundamental aspect of the verification process is how the performance of an emission control system is characterized. For PM, three broad levels are used to establish PM reductions, which are defined by a lower bound in performance. Level 2, for example, is defined by PM reductions greater than or equal to 50 percent. This is in contrast to how the Procedure currently verifies NOx reductions, which are established in 5 percent increments. A system can, for example, be verified to a 45 or 50 or 55 percent NOx reduction.

One of the problems with simply using 5 percent increments for NOx verifications is the inherent performance variability of emission control systems under different conditions. An SCR system, for example, has the potential for reducing emissions of NOx anywhere from zero to 90 percent depending on the exhaust temperature. Defining a window of performance of only 5 percent with some degree of accuracy tends to require a narrowly-defined scope of the verification. Because of the large-scale need for NOx reductions, narrowly-defined verifications are not useful in an in-use regulatory strategy.

2. Description of Proposal

To enable more broadly-defined verifications, staff proposes to use a verification ranking for NOx reductions similar to that used for PM. As shown in Table 5, staff's proposal is to use five levels, called Marks, defined by lower bounds of NOx reduction performance. The lower bounds are equally spaced in 15 percent increments. Reductions less than 25 percent would not be verified. Currently, reductions less than 15 percent are not verifiable. In light of growing numbers of high-efficiency NOx systems, however, and the need for significant NOx reductions from in-use vehicles and equipment, there is little reason to spend valuable resources evaluating much lower efficiency systems. Staff therefore proposes the higher 25 percent threshold.

Table 5: Proposed NOx Reduction Classifications

Pollutant	Reduction	Classification
NOx	< 25%	Not verified
	≥ 25%	Mark 1
	≥ 40%	Mark 2
	≥ 55%	Mark 3
	≥ 70%	Mark 4
	≥ 85%	Mark 5

Staff defined the five Marks in large part based on the performance of existing technologies, some of which are already verified. Lean NO_x catalyst technology would be an example of a Mark 1 system. One such system is currently verified. Exhaust gas recirculation (EGR) systems that tend to achieve 40 to 50 percent NOx reductions would qualify as Mark 2 systems. Two such systems are currently verified at this level of performance. Mark 3 would likely include SCR systems that do not have sophisticated control schemes or which have lower operating temperature criteria. With NOx reductions greater than 70 percent, Mark 4 would encompass the higher-efficiency SCR systems, one of which has been verified for limited off-road use. Staff does not expect many systems to be verified at the Mark 5 level, which is at the upper limit of SCR system performance. More narrowly-defined verifications, in particular those involving engines with minimal transient operation, might lend themselves well to the Mark 5 classification.

Under the proposed system, emission control systems that achieve both PM and NO_x emission reductions would be characterized by two level designations. For example, a wall-flow DPF combined with a high-efficiency SCR system might qualify as a Level 3, Mark 4 system. Systems that achieve NO_x reductions alone are currently not candidates for verification under the Procedure, but as previously described, staff is proposing to change this on a limited basis.

C. REQUIREMENTS FOR SCR SYSTEMS

1. Background

Diesel emission control systems that use SCR technology are growing in number and maturity, but the Procedure does not explicitly address certain key issues

facing the technology. Though well-proven in its ability to reduce NOx emissions, an SCR system requires a continuous supply of a reductant (often a solution of urea and water) to function properly. Ensuring that end-users maintain a continuous supply of reductant, however, is not a trivial matter. If an SCR system were to run out of reductant while a truck is in use, for instance, there is no effect on the engine or any other natural consequence that could compel the end-user to refill the reductant tank. As a result, no NOx reductions would be realized. For SCR technology to be a viable option for controlling NOx emissions, there must be some reasonable level of assurance that the reductant supply will not be interrupted thereby ensuring the continued performance of the system.

2. Description of the Proposal

To ensure that systems using SCR technology achieve NOx reductions in practice, staff proposes new additional requirements. First, staff is proposing that SCR-based systems must include a system to both monitor the amount of reductant available and notify the operator when the level is low. Second, staff is also proposing that SCR systems include an effective means to induce the operator to maintain a constant supply of reductant. Staff is not proposing to prescribe a given method, but rather to have the applicant submit one for approval. One example of this is to prevent the engine from starting the next time the operator attempts to turn it on. Another example is to de-rate the engine such that its power output is noticeably lower. In both cases, operation would resume as usual once the reductant tank is refilled. The third requirement that staff proposes is for SCR systems to include a means to ensure that the reductant present in the tank has the right composition for proper system operation. If the operator simply pours water or any other incorrect liquid into the tank, the SCR system should be able to detect a problem. For urea-based systems, one direct method for fulfilling this requirement might be to employ a urea quality sensor, which is relatively new technology. An indirect method is to use NOx sensors in the exhaust system to determine whether the expected NOx reductions are actually occurring.

D. REQUIREMENTS FOR NOx EMISSION MEASUREMENTS DURING DURABILITY AND FIELD DEMONSTRATIONS

1. Background

One of the most important elements of the verification process is ensuring that a system can work in the real world, not just in a laboratory setting. Therefore, the Procedure requires that a system be installed and used on a representative vehicle or piece of equipment as part of a durability demonstration or field demonstration. Also, for all aftertreatment-based systems, the applicant must measure and record the exhaust temperature and backpressure during the

demonstration. These data provide a record of activity as well as insight into the functioning of a system while in actual use. Backpressure data from a DPF-equipped vehicle, for instance, can show whether the system regenerated properly over the course of the demonstration.

For NOx emission control systems, however, the in-use data required by the Procedure shed little light on in-use performance. The most common NOx control systems use open-channel catalysts together with a chemical reductant that is injected into the exhaust stream. Backpressure and exhaust temperature data give no indication as to whether the injection system is operational, whether the system delivers the right amount of reductant at the right time, or whether actual NOx reductions are achieved. At present, staff must rely exclusively on emissions testing in a laboratory following completion of the durability demonstration.

2. Description of the Proposal

To assist in the evaluation of in-use performance of aftertreatment-based NOx emission control systems, staff proposes that NOx emissions both upstream and downstream of the NOx device be measured and recorded during portions of the durability and field demonstrations. The proposal would apply to the first and last 100 hours of the durability demonstration and the entire field demonstration, if one is conducted. The applicant must propose a measurement method for approval by ARB.

Although requiring in-use NOx emission data would be a new element in the verification process, it is not impractical or overly burdensome because most NOx emission control manufacturers are already using technology that can generate such data. Of the nine manufacturers staff is aware of that currently offer or plan to offer NOx retrofits, seven have products that rely on in-use NOx measurements to function properly. These systems use one or two NOx sensors and a means to measure mass flow such as a mass air flow (MAF) sensor to estimate real-time NOx mass emissions. An example of published data generated by such a system can be found in a paper authored by staff of Johnson Matthey, Incorporated (Conway et al, 2005). In-use measurement systems that employ NOx sensors would meet staff's proposed requirements, and would in fact be the most likely option used by applicants.

E. RECISION OF ELEVATED NOx EMISSIONS TESTING

1. Background

In the 1990's, engine manufacturers utilized computer-based strategies in on-road engines that allowed the engines to comply with emission limits under certification testing conditions, but also allowed increased NOx emissions during

highway driving. U.S. EPA and ARB consider these strategies to be defeat devices (a.k.a. dual mapping and transient sensing algorithms) that result in significantly elevated off-cycle NOx emissions. To evaluate how a NOx emission control system would perform under such off-cycle conditions, the Procedure requires testing with an additional test cycle designed to trigger episodes of high NOx emissions.

One fundamental issue with this requirement is that there is no standard method or test cycle which is guaranteed to trigger off-cycle NOx emissions for all engine makes and models. The parameters and conditions that an engine's control system uses to activate defeat devices vary from engine to engine. Staff has had only limited success with emissions test conditions that reliably result in off-cycle emissions.

Besides being difficult to implement, the off-cycle NOx test requirement is much less relevant today than it was at the time it was adopted in 2002 as part of the original Procedure. Because of ARB's Low NOx Software Upgrade Program, trucks with defeat devices have been getting reprogrammed in recent years to emit less NOx. At present, staff estimates that about 70 percent of these trucks have already been upgraded with low NOx software. The population of trucks with off-cycle NOx emissions has greatly diminished, and along with it the need to evaluate NOx emission control systems under off-cycle conditions.

2. Description of the Proposal

Staff proposes to remove the requirement to test an on-road NOx emission control system under conditions that generate off-cycle emissions. This will reduce verification costs and simplify the overall process.

F. REQUIREMENT TO RECORD REDUCTANT USAGE

1. Background

Staff expects the Procedure to be used more frequently in the near future to verify a growing number of NOx emission control systems, in particular those that rely on a reductant such as urea. Although the Procedure currently requires measurement of all the primary pollutants, exhaust temperature, and backpressure during emissions testing, it does not require measurement of the amount of reductant consumed over a given test cycle. Knowing the amount of reductant consumed gives insight into the functioning of a system during testing and is also a useful consistency check when compared with the amount of NOx reduced over a given test run. For these reasons, U.S. EPA included reductant consumption as an ancillary measurement in its verification protocol for SCR systems (U.S. EPA, 2003).

2. Description of the Proposal

For systems that use a reductant to reduce emissions of NOx from on-road or off-road applications, staff proposes that the amount of reductant consumed during each test run must be measured and recorded.

VII. PROPOSED ADMINISTRATIVE AMENDMENTS AND OTHER CLARIFICATIONS

This chapter discusses staff's proposed amendments that clarify current requirements of the Procedure. The discussion also explains the need for such modifications and how they will improve the Verification Program.

A. CHANGES TO THE IN-USE COMPLIANCE REQUIREMENTS

1. Background

Manufacturers of verified control technologies must meet warranty and in-use compliance requirements for each verified product. In-use compliance ensures that control systems are still functioning at their verified performance levels in real applications. This ensures that the Verification Program is effectively supporting the fleet rules by providing verified systems with real and durable emissions reductions.

The in-use compliance requirements of the Procedure require applicants to obtain at least four test units[2] for testing for two distinct test periods, Phase 1 and Phase 2. Phase 1 testing ensures verified emissions reductions early on during the in-use period and is intended to reveal any problems that can be addressed prior to widespread distribution of the product. Phase 2 testing is intended to ensure verified emissions reductions throughout most of the warranty period of the product, thereby ensuring that the anticipated emissions reductions from ARB's fleet goals are being realized.

Phase 1 test units must be in use for at least one year or within three months of their first maintenance, whichever comes first. Phase 2 test units must be in use 60 - 80 percent of the minimum warranty period. To pass in-use testing, the in-use control systems must reduce emissions by at least 90 percent of the lower bound of their verified levels during each test phase. For example, a Level 2 verified DECS (reduces PM emissions by 50 percent or more) must reduce PM emissions by at least 45 percent during Phase 1 and Phase 2 in-use compliance testing. In addition they must not increase mass emissions of NO_2 by more than 33 or 22 percent of the baseline NOx emission level for systems verified under the 30 or 20 percent NO_2 limits, respectively.

Even though the onset of in-use compliance requirements begins when 50 units are sold, the Procedure does not currently specify a timeframe applicants have to complete the in-use compliance requirements. Currently, applicants are required to perform this testing after selling the fiftieth unit and they are expected to submit results in a timely manner. However, the lack of specific deadlines has delayed the in-use performance evaluation process for many verified control systems. ARB staff have concluded that explicit deadlines for in-use compliance

[2] The term "unit" refers to the diesel emission control system or technology.

information are necessary for the performance evaluation of verified control technologies. The addition of deadlines to the Procedure would provide a more structured in-use evaluation process for staff and device manufacturers, and it would also ensure that critical information is received in a timely manner and should expedite the in-use compliance process. The proposed deadlines are a clarification of what is already required.

Despite the current requirement for retrofit manufacturers to submit test plans and in-use compliance data, ARB staff has not received sufficient in-use compliance reports from many of the verified manufacturers. Retrofit manufacturers have provided a number of reasons as to why they have not submitted this data. Some applicants undergoing the in-use compliance process have experienced difficulty locating and obtaining in-use units primarily because they did not establish a mechanism to keep track of their sold systems. Staff believes it is necessary to explicitly require record keeping in the Procedure to have a successful in-use compliance program. The original intent was for applicants to keep necessary records that would allow them to meet in-use compliance requirements. The lack of specific requirements showing that intent has resulted in an in-use performance evaluation process that is not robust. If records are kept for each control system and contain updated end user contact information, a description of the vehicle or equipment on which the unit is installed, and a description of the engine on which the unit is installed, applicants will be able to identify appropriate candidate systems for in-use compliance testing. It will also help reduce the risk of companies being penalized because of non-compliance.

The Procedure also currently requires applicants to submit a testing proposal prior to in-use compliance testing. Applicants must receive approval from the Executive Officer before commencing in-use compliance testing. The Procedure does not clearly identify what information must be included in the testing proposal. It was expected that the testing proposal would contain enough information such that the Executive Officer can determine if the proposed units are a representative sample for in-use compliance testing. Manufacturers have indicated the current requirements are not sufficiently clear and that they require more explicit instructions. Based on this, and due to the insufficient testing proposals staff has received, staff believes a clarification of this required information is needed.

Currently, the Procedure specifies that if any test unit fails in-use compliance testing, the applicant must select two additional units for testing and provide a report detailing the causes of the failure. The Procedure is unclear as to the selection of the additional units. As a result, applicants may choose inappropriate test units since no staff review is required. Staff is proposing to correct this by including an approval process for the additional units.

2. Description of the Proposal

Staff proposes to include new requirements for when the testing proposals for each in-use test phase must be submitted. The Phase 1 testing proposal would be required to be submitted no later than 90 days after the fiftieth unit was sold. The Phase 2 testing proposal would have to be submitted no later than 3 years after the fiftieth unit was sold. Since the in-use compliance requirements are for units that have been in use, applicants that have sold but do not have 50 units installed on vehicles or equipment may request the Executive Officer to delay their submittal deadlines.

The proposed amendments would also specify what is to be included in each testing proposal. Under staff's proposal, the following information would be required:

(1) Applicant identification.

(2) Diesel emission control strategy family name.

(3) Parties to be involved in conducting in-use compliance tests.

(4) Test facility identification and description.

(5) Quality control and quality assurance procedures for the test equipment.

(6) List of candidate test units (at least 10 units per test phase) with the following information provided for each: vehicle/equipment information on which the unit is installed (make, model, model year), location, engine information (family name, make, series, model year, displacement), date of manufacture, date of installation, and cleaning/repair history.

(7) Cumulative sales of the emission control strategy family in each application.

(8) Predicted mileage or hours of use each diesel emission control system will have accrued by the time it is obtained.

(9) Description of test vehicles and engines (engine family name, make, model, model year, displacement)

(10) Testing plan for completing in-use compliance emissions testing.

Applicants with approved test plans will be notified in writing by the Executive Officer. Staff is proposing that applicants submit Phase 1 in-use compliance reports no later than 18 months after the fiftieth unit was sold. The Phase 2 report would have to be submitted no later than 4 years after the fiftieth unit was sold. Establishing a deadline based on the sale of the fiftieth unit will provide a clear timeframe for the applicant to complete in-use compliance requirements. The predictable evaluation timeline and standardized information should in turn

help staff better evaluate the effectiveness of verified control systems in reducing emissions from existing diesel engines.

Staff also proposes that during each phase of testing, if a test unit fails, the applicant be required to submit a testing proposal for two additional test units within 30 days of the failure. The testing proposal would include an investigative report detailing the causes of the failure. This proposed new 30 day deadline for the testing proposal of the new test units would require applicants to submit all the required information in a reasonable time. This should allow staff to address any problems and prevent the in-use compliance process from continuing indefinitely. Within 45 days of receipt, the Executive Officer would notify the applicant whether the testing proposal was sufficient. After receiving approval from the Executive Officer, the applicant would have to complete testing.

B. ADDITIONAL RECORD KEEPING REQUIREMENTS

1. Background

The Procedure requires applicants to provide warranty coverage for end users that purchase their control systems. As part of this warranty coverage, each applicant is required to provide annual warranty reports that document their annual and cumulative sales and leases in California, annual and cumulative production in California, and annual warranty claims in California. The warranty claims are to include a description of replacements and repairs, the engine families and vehicles on which the control systems were installed, and an explanation of denied warranty claims. The warranty and in-use compliance requirements are complimentary. That is that information obtained from annual warranty reports may aid in an appropriate in-use performance evaluation for a verified control system. Likewise, information received during an in-use compliance evaluation may support any information or issue discovered in the warranty process.

As was previously discussed, accurate record keeping is critical for both in-use and warranty reporting requirements. Proper records will show that the control systems are installed on fleets regulated by the fleet rules and allow for more refined evaluation of the systems' effectiveness in the field. However, to date, verified control systems manufacturers have not been equally diligent in fulfilling their warranty reporting obligations or their in-use compliance requirements. Therefore, staff proposes to clarify the reporting requirements for these elements of the Procedure as discussed below.

2. Description of Proposal

Staff is proposing to require applicants to keep updated records of the following information:

1. End User Contact Information
   - Name
   - Address
   - Phone Number

2. Description of Vehicle/Equipment On Which Unit Is Installed
   - Type of vehicle/equipment
   - Make
   - Model year
   - Vehicle Identification Number

3. Description of Engine On Which Unit Is Installed
   - Make
   - Model
   - Model Year
   - Engine Serial Number
   - Engine Family Name

Applicants would be required to keep these records until the in-use compliance requirements are met. Applicants would have to submit these records only upon request within 30 days. Applicants that received conditional verifications or conditional extensions would have to submit their records to the Executive Officer one year after receiving their conditional status in addition to submitting them upon request.

C. REQUIREMENT FOR CALIFORNIA SALES

1. Background

ARB's Verification Program is well known and highly regarded by manufacturers and government agencies throughout the country and even the world. Some programs outside of California favor ARB verified products when considering retrofit contracts. Therefore, manufacturers have incentive to be ARB verified even if they do not plan on participating in the California market. Staff wants to ensure that state resources used to verify diesel emission control systems are expended on applicants that will sell or pursue sales of their systems in the state in order to support California's fleet rules. ARB resources dedicated to verifications are limited. Utilizing resources on evaluating control systems only intended for sale or use exclusively out of state negatively impacts the Verification Program from producing verified technologies that will support fleet rules. Applicants who intend to market their devices exclusively outside of California may participate in U.S. EPA's Voluntary Retrofit Program.

2. Description of Proposal

Staff proposes that applicants who receive verifications, conditional verifications, or conditional extensions must demonstrate sales of their verified products in California. If they have not yet sold systems in California, the proposed amendment would require them to demonstrate that they have actively pursued sales and that their product is available to be sold to end users in California. If applicants can not provide such confirmation, the Executive Officer will evaluate whether the verification should be revoked.

D. CLARIFICATION FOR VERIFICATION TRANSFERS, ACCEPTANCE OF PRE-EXISTING DATA, SYSTEM LABELING, AND SALES AND INSTALLATION

1. Background

- Verification Transfers

Currently, the Procedure allows the transfer of an existing verification between consenting parties provided certain requirements are met. While this practice has been relatively uncommon thus far, staff wishes to clearly define the requirements of a verification transfer. Any applicant who wishes to market a product that was previously verified by another applicant may do so with the consent of the original verification holder provided they meet the requirements of verification. This includes the submission of an application and letters of consent from the original entity holding the verification. These letters must expressly state that the new applicant is permitted to market the product and use the data and information that supported the original verification. In addition, the new applicant must demonstrate a thorough understanding of how the product relies on sound principles of science and engineering to achieve the verified emissions reductions. If the new applicant elects to change the original verification in any way, including expanding the scope of the verification to include more applications than originally authorized, or expanding the conditions of the verification, then they must provide any additional information requested by the ARB to support the change.

- Acceptance of Pre-Existing Data

While the Procedure does not currently preclude the submission of pre-existing data in support of verification, staff is seeking to clarify its allowable use in light of recent questions by stakeholders. In some cases, applicants may have data generated from tests previously conducted for other emission reduction programs such as U.S. EPA's voluntary Retrofit Program or Verminderung der Emissionen von Realmaschinen im Tunnelbau (VERT). Pre-existing data may be used to support an ARB verification if it meets the requirements of the Procedure.

Allowing the use of pre-existing data significantly reduces the amount of testing needed for verification without compromising the integrity of the Procedure. Pre-existing data may be used to support verifications, conditional verifications, and extension applications.

- System Labeling

The Procedure currently requires applicants to ensure that a legible and durable label is affixed to both the diesel emission control system and the engine on which it is installed. It is important that the labels for any verified diesel emission control system not only be durable and resistant to tampering, but also easily visible. Preliminary information from regulated fleets indicates that device labels are often not visible after installation. In some cases, labels have been located under brackets or between the device and the vehicle chassis making viewing the labels nearly impossible. In addition, some engine labels have been installed that do not match the diesel emission control system label. Affixing visible and appropriate labels eases inspections of regulated fleets and provides a means of quickly determining if a control device is verified by ARB. There have also been cases of labels containing multiple diesel emission control strategy family names. It is important that each label identify only one DECS and that the label on each engine corresponds only to the DECS installed on that particular application. The original intent of the labeling requirement was to ensure that any diesel emission control system could be easily identified as a verified system for use in support the fleet rules.

- Sales and Installations

The Procedure was developed to ensure that diesel emission control systems produce real and durable emissions reductions. During the verification process, staff works closely with device manufacturers to identify emission control groups appropriate for each device. Once verified, an Executive Order is issued for the device which contains the relevant information pertaining to the selected emission control group. Parties that sell and install diesel emission control systems must ensure that they are installed only on applications that are within the appropriate emission control group as defined by the Executive Order. Information from regulated fleets indicates that verified systems have been installed on applications that are outside the terms of the governing Executive Order.

2. Description of the Proposal

- Verification Transfers

Staff proposes to clarify ARB policy regarding verification transfers. The clarifying language would explicitly state all the necessary requirements for verification transfers as discussed previously.

- Acceptance of Pre-Existing Data

Staff proposes to clarify ARB's policy regarding the acceptance of pre-existing data. The language would direct applicants that have participated in other diesel emissions control programs and/or generated useful data to submit an application including such data. ARB would evaluate the submitted data to determine if it satisfies requirements unique to the Procedure. Any data deemed sufficient per the Procedure would be accepted and the applicant would be notified of any additional data, testing, or information needs.

- System Labeling

Staff proposes to clarify the system labeling requirement by adding language that the system labels be identical and visible after installation. The proposal also clarifies that the labels must be durable and resistant to tampering or any degradation from the conditions of its environment.

- Sales and Installations

Staff proposes to amend the Procedure to include language specifying that no person or entity shall install any device, apparatus, or mechanism on vehicles or equipment as verified unless expressly allowed under the terms of the issued Executive Order. As such, control technologies installed on applications that are not within the terms of the Executive Order are not verified technologies and thus will not satisfy the requirements of the fleet rules. In addition, such installations may incur additional penalties if the installed systems do not have the appropriate vehicle code exemptions. The amendment would also require that applicants, distributors, and/or installers ensure their verified products are only installed on appropriate applications.

E. CLARIFICATIONS OF DEFINITIONS AND APPLICATION PROCESS

1. Background

The Procedure and the amendments to the Procedure include definitions of all terms that are not self-explanatory. These definitions were developed by staff with input from stakeholders and help to clarify the requirements of the regulations.

In addition, the application process described in section 2702 of the Procedure has several minor inconsistencies and does not currently address all of the

required information necessary for submission of a complete verification application. For instance, section 2702 of the Procedure describes the information required for submission of a verification application and identifies the appropriate format. This section could be clarified to help applicants better understand the process and ensure that all of the required information is clearly identified. Such clarifications could expedite the application process by providing detailed instructions and a clear understanding of all of the information necessary for submission of a complete verification application. This will generate more complete initial applications and require less correspondence with applicants to obtain missing information.

2. Description of the Proposal

Staff proposes to define "advertise", "distributor", "end user", "installer", "seller", and "warrantable condition". For a complete list of definitions please refer to Appendix A.

In addition, staff proposes modifying the application process description in section 2702. The modifications include renaming "proposed verification testing protocol" to "preliminary verification application", changing the submittal address to Sacramento, California where the current branch chief is located, and expanding the list of information needed in the application format template found in section 2702(d). Currently, all required data and information is specified throughout the Procedure although it is not necessarily listed in the template found in section 2702(d).

F. REQUIREMENT TO PROVIDE THE INSTALLATION MANUAL AND PART'S LIST

1. Background

The Procedure does not currently require that an applicant submit a complete copy of their installation/owners manual or a complete part's list for their diesel emission control system. Copies of these materials are essential for the effective evaluation of the diesel emission control system and provide staff with a better understanding of how these products will be introduced to end users. Since fleet owners will be installing verified control systems to comply with ARB fleet regulations, it is important that staff become familiar with every part of the control system while evaluating the technology. A more thorough evaluation will likely result in fewer problems for end users. These materials will also help staff respond to applicant's requests regarding proposed changes their products. In addition, a part's list is essential in identifying all parts of the system that are subject to the warranty requirements of the Procedure.

Staff also believes that additional information should be required to be included in an applicant's installation/owners manual. For instance, staff is aware of situations where fleet owners might want to remove control systems from vehicles on which they were originally installed and re-install them on other vehicles within their fleet. This may take place if a vehicle is damaged or during the cleaning and/or maintenance of the control system or the vehicle. Staff believes the applicant should clearly authorize the use and effectiveness of their product in this manner, and identify any conditions regarding this practice to the Executive Officer and end users. This information will ultimately help applicants and end users in matters regarding warranty claims.

2. Description of Proposal

Staff proposes that applicants provide a copy of the installation/owners manual that would be supplied to installers and/or end users. Applicants would include descriptions of appropriate end user installation practices. The proposal would require applicants to also include a part's list that includes all primary components of the control system including, but not limited to:

- substrates
- electronic control units
- sensors
- injectors
- pumps
- blowers
- storage tanks
- notification lights

Applicants would give a description and identification number to each part and specify which parts were excluded from the required warranty coverage, such as in the case of a consumable or disposable part. Under staff's proposal, the Executive Officer would approve of any parts excluded from the required warranty coverage.

Applicants would also need to specify if they authorize, after receiving approval from the Executive Officer, the removal of control systems by end users from their original installations and installing them on other vehicles or equipment. If so authorized, applicants would need to specify appropriate end user installation practices in the installation/owners manual. Applicants would also need to specify possible consequences should an end user elect to perform an unauthorized installation practice. As part of their submittal, applicants would need to include descriptions of circumstances that might result in denial of a warranty claim provided that it does not limit or modify the warranty requirements established in section 2707 of the Procedure. Staff's proposed changes would also specify that applicants that permit the end user installation practices

described above are still responsible for the warranty and in-use compliance requirements of those control systems.

G. OTHER MINOR CLARIFICATIONS

Staff has also determined that it is necessary to allow the Executive Officer to request records from applicants regarding their control systems at any time. In some cases this might be necessary to perform a complete evaluation of a technology for compliance purposes. Staff has also experienced trouble receiving required information such as warranty and in-use compliance reports from some applicants. In addition, staff is aware of applicants that are not following appropriate sales and installation practices. Since the Verification Program supports ARB fleet regulations, it is necessary to allow the Executive Officer to request records pertaining to certain control systems to ensure applicants are complying with all of the requirements of the Procedure. In addition, staff may also need additional information to ensure that certain products are still appropriate for verification. In all cases, based on this review and other relevant information, the Executive Officer would be able to take any appropriate actions, including lowering the verification level, revoking the verification status, or suspending review of all other applications sent by an applicant that has not provided required submittals or fraudulent submittals.

In addition, staff proposes that all DECS with aftertreatment devices, such as diesel particulate filters, be designed such that they can only be installed in one unique direction. To assist end users and installers in ensuring the device is properly installed, the device would also need to clearly show the proper direction for the exhaust flow. Currently, there is no such requirement. Thus devices can be installed backwards. If the exhaust enters the aftertreatment device flowing in the opposite direction from which it originally flowed, it could release PM that has accumulated inside the device and compromise emissions reductions. Also, reversing the direction of flow can compact soot within the device, impacting its ability to properly function or regenerate, resulting in device failure.

Staff is also proposing a number of other minor clarifying amendments which would:

- Specify discrete mode emissions testing for control systems intended for stationary applications in section 2703(e)(3)
- Allow the Executive Officer to require additional testing if it is needed for a complete evaluation of the control system
- Require the backpressure monitor notification system to be visible to the operator during normal operation of the vehicle or equipment

- Allow the Executive Officer to require applicants to submit records pertaining to their control systems
- Clarify the Executive Officer's right to seek remedial action against the applicant under provisions of Part 5, Division 26 of the Health and Safety Code

VIII. REGULATORY DEVELOPMENT

This chapter describes staff's interaction with the public and the effects of those meetings and discussions on the proposal.

A. PUBLIC OUTREACH

In developing the proposed amendments, staff held four public workshops in Los Angeles, El Monte, and Sacramento. Staff presented the proposed amendments and received questions and comments from stakeholders. Attendees were mostly comprised of representatives from diesel emission control system manufacturers and installers. Staff also held numerous meetings with the Manufacturers of Emission Controls Association (MECA) and individual companies to further discuss the proposal. All comments received by staff while developing the proposed amendments were considered.

B. ISSUES RAISED

During the regulatory development process, representatives from industry expressed concerns regarding the record keeping requirements. The two key issues raised were, 1) the ability to track a large number of applications on which the sold units are installed and, 2) the release of proprietary information. After considering these comments, staff is confident that applicants should be capable to track their sold control technologies until the in-use compliance requirements are completed. Once the in-use requirements are completed, applicants would no longer be responsible for keeping such information. In response to the second issue, as long as the information is so identified, staff adheres to both the confidentiality policy required by the Procedure, as well as the requirements of title 17, CCR, sections 91000-91022. For the most part, the applicants would be the only parties responsible for keeping the information and for submitting it, should the ARB so request.

Also, during the development of the proposed amendments, industry representatives requested a transition period to meet NRTC testing requirements for off-road applications. They also voiced concern over staff's initial proposal to require cold start testing under the NRTC. Staff addressed these issues by giving applicants more time to test using the ISO 8178 C1 test cycle and not requiring cold start tests under NRTC testing. Staff's proposal would allow applicants to continue testing their systems using the ISO 8178 C1 test if they submitted their preliminary verification applications before October 1, 2008, and receive a letter of notification from the Executive Officer dated no later than December 31, 2008, confirming that the preliminary verification application is complete. Also, as previously discussed, the cold start emissions reductions are only given a 5 percent weighting towards the final results, and as such, staff has proposed to not require cold starts as part of the NRTC testing.

IX. REGULATORY ALTERNATIVES

The ARB is required to do an analysis of reasonable foreseeable alternative means of compliance with the proposed amendments. While developing the proposal, staff considered several alternatives which are discussed below. ARB staff has concluded that the proposed amendments provide the best means of improving the Procedure to reduce public exposure to diesel particulate consistent with protection of public health.

A. Do Not Provide the Option for Applicants to Receive Conditional Extensions

Staff proposed providing conditional on-road extensions with the goal of introducing qualified control technologies into the market as quickly as feasible for products that have a high probability of achieving real and durable emissions reductions on new applications. However, staff considered not proposing this amendment. The effect of not proposing this change would mean that effective products that fleet owners could choose to meet fleet rules would not be expeditiously identified as verified products. Staff is confident in proposing this change because only products that have previously shown real and durable emissions reductions under the requirements of the Procedure would be considered for conditional extensions. Applicants receiving conditional extensions would have to provide all the necessary data and information within one year while being able to sell the product as ARB verified. This additional data and information would confirm that the product is appropriate for the new application. Since verified technologies have successfully gone through the verification process, staff already has a high level confidence in these products.

If it can be determined that the technology will perform just as effectively for new applications not included in the existing verification, staff believes the product should be treated as a verified product while confirmatory data and information is being developed. If applicants must provide all confirmatory data and information prior to receiving an extension, there will be a significant delay before receiving ARB recognition. This delay will not give end users as many choices to meet the requirements of the ARB fleet regulations. Therefore, staff does not support this alternative.

B. Do Not Verify NOx Only Reduction Systems

The Verification Program could maintain its current restriction on verification to systems that reduce PM by at least 25 percent. However, since the Verification Program supports other ARB regulations, the inclusion of NOx only control systems should provide much needed support of future regulations and programs that may either require or provide incentives for NOx reductions from diesel engines. Thus, staff does not support maintaining the current requirement in its present form.

C. Do Not Change Evaluation of All Fuel-Based Control Systems

Staff considered keeping the current requirements regarding alternative diesel fuels, which must follow the requirements of section 2710, and fuel additive-based systems, which must follow requirements in sections 2700 through 2709, separate in the Procedure. However, staff does not support this alternative because the information and data required for alternative diesel fuels are equally pertinent for fuel additive-based systems.

The main difference between the requirements of section 2710 and sections 2700 through 2709 is the emissions testing requirements, for which alternative diesel fuel systems must meet a more rigorous requirement. Section 2710 requires comparative emissions testing with a reference fuel and the alternative diesel fuel. Applicants that conduct cold and hot start tests must conduct at least 5 emissions tests for both the reference and alternative diesel fuels. Applicants that only conduct hot start tests must complete at least 20 tests for the reference and alternative diesel fuels.

In contrast, currently for fuel additives, sections 2700 through 2709 only require one set of baseline and control tests that consist of at least one cold start and three hot start replicates as required. Staff believes a more comprehensive evaluation of fuel additive-based technology is needed to ensure they are appropriate for fleets that must meet emissions requirements of the various ARB fleet rules, and to ensure the fuel additive does not cause adverse effects on the environment. The effects a fuel has on an engine and the emissions of an engine cannot be effectively gauged through one set of baseline and control testing, as is sufficient for hardware-based control systems. The repetitive testing required in section 2710 is designed to accurately evaluate emissions reductions and any changes to emissions caused by the fuel. The repetitive results show the relevance of errors that may occur during testing and allow staff to determine if the fuel causes real and durable emissions reductions. Since fuel additives and alternative diesel fuels are both fuels that reduce emissions, they should have similar testing requirements.

D. Do Not Add Clarifying Language for the In-Use Compliance Requirements

An alternative to the in-use compliance amendments is to not require applicants to submit their testing proposals and test reports within a specified period of time, as is currently the case. The lack of a deadline has resulted in delayed in-use compliance evaluations. Staff already has trouble receiving sufficient in-use compliance test proposals. It is important for staff to receive this information in a timely fashion to determine if the Verification Program is effectively supporting the various ARB fleet regulations. For this reason, staff does not recommend this alternative.

Another alternative is to not specify what would be required in the in-use compliance testing proposals for each phase. Staff seeks to make the Procedure as clear for applicants as possible. If the Procedure does not specify what staff needs in a complete testing proposal, most testing proposals will not be sufficient plans for successful in-use compliance testing and the numerous revisions of the testing proposal would delay the in-use compliance evaluation process. Therefore, staff does not recommend this alternative.

An alternative regarding in-use testing failures is to not have applicants submit a testing proposal for ARB approval for the two additional units that need to be tested. If applicants test additional units without staff's approval, the results may not be acceptable and additional testing may be needed, resulting in additional time and expense. In addition, a thorough description of the cause of failure will help staff properly advise applicants which in-use units would be appropriate for testing and it would also help staff determine if a more extensive evaluation is necessary. Consequently, staff does not recommend this alternative.

E. Do Not Require Sales in California

Staff could keep the Verification Program open to applicants that do not intend to sell their control systems in California. However, since the Verification Program was created to help ARB reach the goals of the DRRP and support other ARB regulations, spending state resources on products that would not support those goals does not best serve the citizens of California. If resources are spent to verify control systems that will not reduce emissions in California, control systems intended for sale in California will take longer to be verified. This will impact the Verification Program's ability to support California's fleet rules. Since another diesel emission reduction verification program is offered by the U.S. EPA in their Voluntary Retrofit Program, applicants who do not intend to sell their products in California can use this program for verification. This provides a mechanism for retrofit manufacturers to verify control systems to be used in the other 49 states.

F. Do Not Allow Non-CCR Compliant Test Fuels

If the current testing requirements are used to evaluate applications that do not typically operate on fuel that meets the specifications of the California Reformulated Diesel Fuel Regulation, the test fuel will not be representative of the real operation of those applications. Further, staff will not be able to verify that the emission reductions of control systems intended for these applications are real and durable. Therefore, staff does not support this alternative.

G. Do Not Change Off-Road Testing Requirements

If no changes are made to testing requirements for off-road verifications, staff will not be able to conduct a satisfactory evaluation of many different kinds of off-

road emission control systems. While steady state testing may be sufficient for the evaluation of certain diesel emission control systems in certain applications, such as non-catalyzed diesel particulate filters, it provides only a very limited picture of the performance of most catalyst-based technologies.

The primary issue with the current steady-state test cycle is its limited ability to show the actual effect of an emission control system on emissions of NO_x and NO_2. Systems to control NO_x emissions that inject a reductant into the exhaust stream, such as those using SCR technology, can have a wide range of performance. Whether a system is able to perform at the high end of its range is largely dependent on the exhaust temperature and its ability to deliver the right amount of reductant into the exhaust stream at the right time. A modal, steady-state test cycle only reveals a system's ability to perform the latter function under prescribed steady-state conditions. As such, performance under actual transient conditions, where NO_x concentrations and exhaust flows vary from one second to the next, remains unknown.

The limitation that the steady-state test cycle poses in the evaluation of a system's effect on NO_2 emissions is somewhat different. In staff's experience thus far, platinum is known to generate significant quantities of NO_2. It oxidizes some of the NO in the exhaust stream to form NO_2, which some diesel particulate filters require to burn out collected soot. The fraction of the NO converted is a strong function of exhaust temperature. Peak NO conversion typically occurs at intermediate temperatures of 300 to 350 degrees Celsius and drops off at both lower temperatures (due to kinetic limitations) and higher temperatures (due to thermodynamic limitations). The Board adopted limits on NO_2 emissions to prevent associated health impacts. However, the steady-state test cycle happens to emphasize very hot modes of operation and can thus suppress formation of NO_2 relative to somewhat cooler transient cycles like the NRTC, which is based on actual off-road operation. Verifications based on steady state test data could lead to non-NO_2 compliant systems being verified and thus result in associated increases in health impacts. For these reasons, staff proposes to change the current off-road verification testing requirements.

H. Allow NOx Only Systems for Any Engine

Staff considered proposing that NOx only DECS be candidates for verification for all applications, including those with installed DPFs not certified with the engine. If staff's proposal was expanded to include engines not equipped with DPFs as original equipment, the potential could exist for one vehicle to be retrofitted with two separate DECS. The primary issue with such a situation is the compatibility of the two systems. Both systems being verified for use with the same diesel engine is not equivalent to being verified for use with each other.

In addition, the Procedure requires applicants to warrant their verified products for up to 5 years or for a certain mileage, whichever comes first. If two applicants

are responsible for the warranty of two separate systems on the same vehicle, there will likely be complications for applicants and end users in the event of a warranty claim. Applicants will have difficulty assessing warranty claims because it might be unclear which control system caused a malfunction. This could result in applicants delaying their warranty responsibilities. Thus, end users may have trouble receiving prompt corrective service. This issue would negatively affect the Verification Program and the fleet rules. For these reasons, staff does not recommend this alternative.

I. No Changes

The current Procedure is a robust evaluation tool that has verified many DECS that provide real and durable emissions reductions from diesel engines. However, to continue to support the fleet rules in the most effective way, including those recently adopted and those to be adopted in the future, the Procedure needs certain modifications. Currently, the Procedure does not provide the following:

- Expeditious extensions of verified technology for new on-road applications
- Verification of DECS that only reduce NOx emissions
- Proper evaluation of all fuel-based DECS
- Flexibility to evaluate DECS intended for applications that cannot properly function on CCR compliant fuels
- Emissions testing that is representative of actual in-use operation of off-road applications
- Pre-conditioning requirements that are equivalent for all DECS
- Effective evaluation of monitoring and notification system functionality
- NOx reduction classifications aligned with NOx reduction technology performance
- Effective evaluation of all components of NOx reduction systems
- More detailed in-use compliance requirements
- Requirement of California sales
- Clarity of the application process and other requirements

Making these modifications would enable the Procedure to continue to be an effective mechanism that ensures real and durable emissions reductions from DECS that are to be installed on regulated diesel fleets. Therefore, staff does not support this alternative.

No alternative considered by the agency would be more effective in carrying out the purpose for which the regulation is proposed or would be as effective and less burdensome to affected private persons than the proposed regulation.

X. ENVIRONMENTAL IMPACTS

The proposal would allow control technologies to get into the on-road market faster, require more appropriate testing for off-road applications, and clarify policies and requirements. Staff does not believe any of these modifications will cause adverse environmental impacts. Staff's proposed amendments will result in unquantifiable environmental benefits by ensuring that there are no NO_2 emission increases from off-road applications relative to other applications, and will provide better quantification of in-use NOx benefits.

The ARB is committed to evaluating community impacts of proposed regulations, including environmental justice concerns. Because some communities experience higher exposures to toxic pollutants, it is a priority of the ARB to ensure that full protection is afforded to all Californians. The proposed amendments are not expected to cause significant negative impacts in any community. The proposed amendments are designed to continue the Verification Program's support of the DRRP and reduce emissions of diesel particulate throughout the state.

XI. ECONOMIC IMPACTS

This chapter discusses the economic impacts staff anticipates businesses will incur as a result of the proposed amendments.

A. Legal Requirement

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

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

B. Estimated Costs and/or Benefits

The economic impacts of the proposed amendments on the State, affected businesses, and individual fleets are not expected to be significant. Participation in ARB's Verification Program is voluntary. Applicants electing to have their diesel emission control systems verified under the requirements of the Procedure choose to do so for financial gain. Verification for these participants translates into increased sales and therefore, increased revenues. For individual fleets subject to ARB's fleet rules, accelerating the verification process should result in additional products being available to meet the requirements of the rules. In some cases this should result in lower compliance costs, such as with early retrofit costs in the in-use off-road regulation. Historically, this increased competition for market share has had the effect of lowering unit prices and may result in a cost benefit to the regulated fleets.

Staff's analysis of the proposed amendments indicates that some may result in a minor cost increase, a cost savings, or have no economic impact. Since the proposed amendments do not universally apply to all applicants it is not possible to determine the aggregate economic impact of staff's proposal. For example, an applicant with a system intended to control PM emissions from on-road vehicles will not be affected by staff's proposed changes to the NOx emissions testing procedures. However, an applicant with a system designed to control NOx and PM emissions from off-road equipment may be required to perform additional emissions testing under staff's proposal. This could result in a cost increase when compared to the current requirements in the Procedure. Therefore, staff has analyzed each proposed amendment to determine the potential for adverse

economic impacts. The following sections discuss the estimated costs and benefits of staff's proposal. Where practicable, the proposed amendments contained in staff's proposal have been grouped together for brevity and clarity. Also, because no direct emissions benefits are associated with staff's proposal, no cost effectiveness analysis could be performed.

1. Conditional Extensions

Based on staff's analysis, the proposal for on-road conditional extensions should provide a cost benefit to regulated fleets. Allowing manufacturers of diesel emission control systems to conditionally verify their products should accelerate the verification process and result in additional devices available for compliance with the fleet rules sooner than would otherwise occur. This could lead to increased competition in the marketplace and possibly, lower unit prices. However, staff's analysis regarding the cost benefit associated with conditional extensions remains qualitative at this time.

2. NOx Only Reduction Systems

Staff's proposed amendment providing a means to verify NOx only emission reduction systems for certain diesel engines should have no adverse economic impact, but will in fact allow companies to verify products that cannot be verified today. Application for the verification of a system that reduces emissions of NOx only would still be voluntary.

3. Proposed Fuel-Based Strategies Amendment

Applicants with fuel additive-based DECS will likely incur additional costs to comply with the proposed fuel-based strategies amendment. Staff's proposal requires applicants with fuel additive-based systems to perform additional emissions testing to align the requirements with those of alternative diesel fuel based systems.

Staff estimates applicants with fuel additive-based strategies currently spend up to $50,000 for FTP emissions testing which includes 1 cold start and 3 hot start tests for both baseline and control configurations. However, applicants with alternative diesel fuel based systems are currently spending an estimated $100,000 to complete emissions testing comprised solely of hot start testing.

Based on this, the proposed additional emission testing for fuel additive-based systems is estimated to increase testing costs by approximately $50,000. In addition, applicants with alternative diesel

fuels are spending an additional $100,000 to satisfy toxics measurement requirements.

If toxics measurements are required for fuel additive-based systems, the costs could increase by an additional $100,000. This raises the verification costs to a level that is comparable to the costs associated with the verification of an alternative diesel fuel based system. However, the Procedure currently requires staff to request toxics measurements under certain conditions for fuel additive-based systems. Therefore, the additional expenses associated with requirements for toxics measurements may not represent an additional cost.

4. Proposed Acceptance of Non-CARB Diesel Test Fuels Amendment

Staff's proposal to modify the Procedure to allow the use of test fuels that do not meet the specifications of California Reformulated Diesel Fuel for durability and emissions testing should provide a cost benefit to applicants. Allowing the use of commercially available fuels where appropriate would relieve applicants of the burden of procuring and using test fuels that are not normally used during actual in-use operation. This should result in lowering the costs associated with emissions and durability testing and may relieve applicants of the burden of modifying fuel delivery systems.

5. Proposed Amendment to Off-Road Testing

The proposed NRTC testing requirement may increase costs for the verification of systems intended for some off-road applications. However, based on current applicant activity, staff estimates that most would not incur significant expenses to satisfy the proposed requirements. To date, staff has accepted data from 5 laboratories in support of the systems currently verified for off-road applications. Two of these laboratories are already capable of performing the NRTC. In addition, another laboratory that has submitted data to support on-road verifications can also run the NRTC. Applicants are familiar with these 3 laboratories. Several laboratory representatives indicated that the cost of running the NRTC and steady state cycles are similar. In certain instances, the NRTC would be less expensive that the steady-state alternative. Therefore, applicants can satisfy the proposed testing requirements with little, if any, cost increase.

Though it is difficult to determine cost estimates for future applicant activity based on past activity, staff estimates applicants using their own test facilities which can currently run transient testing (but not the NRTC) might spend an additional $35,000 to $500,000 to purchase the

software and hardware necessary to perform the NRTC. As an alternative, applicants may use their own staff to develop and install software and hardware. Cost estimates for this option are unknown.

Applicants whose labs can currently only run steady state testing might require an additional $250,000 to $3,000,000 to upgrade their facilities to accommodate the NRTC. Staff estimates that applicants or independent laboratories that wish to build a completely new test cell that can support NRTC testing could spend up to $5,125,000. Staff estimates that a new steady state test cell costs up to $1,200,000. Therefore, applicants could incur up to $4,000,000 in additional costs to build a new test cell that can run the NRTC relative to a steady state test cell. This estimate is an approximation, and is dependant upon several factors including the selection of vendors and equipment.

In spite of staff's proposal, testing facilities will still need to be upgraded to run the NRTC to accommodate testing requirements for Tier 4 off-road engine certification. Also, the adoption of the in-use off-road regulation will result in fleet owners buying thousands of DECS. For applicants testing at their own facilities, the cost increase of upgrading their facilities to run the NRTC could result in a small incremental increase to each DECS sold. For example, if an applicant spends $500,000 to upgrade their laboratory to run the NRTC and they sell 1,000 units for off-road applications, they would incur an incremental cost of $500 per DECS. However, this impact represents less than a 5 percent increase in the cost of the DECS.

6. Proposed Amendment to NO_2 Pre-Conditioning Requirements

The addition of an alternative backpressure criterion to determine whether a service accumulated system requires pre-conditioning should have no economic impact. Staff's proposed changes have the effect of treating all systems equally with respect to the NO_2 pre-conditioning requirements.

7. Proposed Amendment of Monitoring and Notification System Functionality

Staff's proposed amendment of monitoring and notification system functionality should have no economic impact. While not expressly stated in the current Procedure, applicants have always been required to address the functionality of any monitoring and/or notification system of a diesel emission control strategy submitted for verification. This amendment provides clarifying language to address this issue and should assist applicants in the verification process.

8. Proposed Amendment to NOx Reduction Classifications

The identification of NOx reduction classifications is designed to facilitate the verification of NOx only emission reduction systems and should have no economic impact.

9. Proposed Amendment for SCR Systems

Staff's proposal for additional requirements for SCR systems is consistent with the requirements of U.S. EPA and new engine certification regarding SCR systems. It is designed to ensure that a continuous supply of reductant remains available while these systems are in use and that the verified emissions reductions are realized in use. For SCR systems to be a viable option for controlling NOx emissions, there must be some reasonable level of assurance that the reductant supply will not be interrupted. Staff's proposed clarifying language is designed to assist applicants in the design and testing of their SCR systems with respect to this issue. As such, this amendment to the Procedure should have no economic impact.

10. Proposed Amendment of NOx Emission Measurements During Durability and Field Demonstrations

Applicants with NOx reduction aftertreatment systems may incur additional costs to comply with staff's proposed durability testing requirement. Applicants most likely will comply by installing two NOx sensors, one upstream and one downstream of the aftertreatment device. Staff estimates the additional costs to comply with the new durability testing requirement could be as much as $5,500 per verification. The cost of compliance for NOx reduction systems that currently employ one or more NOx sensors should be significantly less.

11. Proposed Removal of Elevated NOx Emissions Testing

The removal of the requirement to perform additional emissions testing using a test cycle designed to trigger episodes of high NOx emissions should result in a cost benefit for certain applicants. The removal of this requirement would reduce the amount of emissions testing required for verification. By eliminating this requirement, applicants may realize a significant cost savings with respect to emissions testing.

12. Proposed Requirement to Record Reductant Usage During Emissions Tests

The addition of the requirement that an applicant measure and record reductant usage during testing, when applicable, should have no

economic impact, as this type of information would likely be collected by the applicant anyway.

13. Proposed Administrative Amendments

Staff's proposed administrative amendments include changes to the in-use compliance requirements, a proposed record keeping amendment, and a requirement that applicants demonstrate sales of their verified products in the State. The record keeping proposal may result in a minor cost increase. Though it is difficult to estimate the cost increase, staff does not expect it to be significant. While additional requirements are included in staff's proposal, these requirements are designed to ensure that applicants have a clear understanding and the information necessary to adhere to the existing in-use compliance requirements and that state resources are appropriately used to benefit the residents of California. These requirements should result in no economic impacts.

14. Other Proposed Clarifications

Staff's remaining proposed amendments regarding verification transfers, acceptance of pre-existing data, system labeling, sales and installations, clarifications of definitions and the application process, proposed manual and part's list requirements, and other minor clarifications should have no economic impacts. These proposed amendments provide clarifying language to the existing Procedure and are designed to assist applicants and accelerate the verification process.

C. Potential Impact on Affected Businesses

Participation in California's Diesel Emission Control Verification Program is entirely voluntary. However, any business or individual that chooses to participate in the program will have to satisfy the requirements of the Procedure. Businesses that choose to participate and thus follow the Procedure include manufacturers and marketers of diesel emission control systems. In addition, some businesses may be indirectly affected, such as system installers, suppliers of raw materials or equipment, and testing laboratories.

The requirements for verification under the Procedure apply to any business that elects to participate in the program regardless of their location. Staff's proposal does nothing to alter the applicability of the program. Manufacturers that participate in the Verification Program need to provide detailed information and data on their products in accordance with the Procedure. The testing required by

the Procedure may require significant expenditures of capital on the part of an applicant.

The proposed amendments to the Procedure would either result in a modest cost savings, cause no change in costs, or increase costs due to the change in requirements for fuel-based systems, off-road testing, and NOx reduction systems. Nevertheless, staff's proposal will enable more verified products to be sold in California by accelerating the verification process thereby ensuring continued compliance with the fleet rules. Several California manufacturers and installers therefore stand to benefit and the increased sales could offset some of the cost increases. Off-road fleet owners may also incur increased costs for DECS because of the proposed changes to the off-road testing requirements. However, as previously discussed, these costs should not be significant.

Should a business choose not to participate in the Verification Program, there are other avenues by which its products may be sold in California. A business obtaining a Vehicle Code 27156 exemption can legally sell a product in California, but can claim no emissions reductions. However, this product would then not be a verified diesel emission control system and would therefore, not satisfy the requirements of the fleet rules.

E. Other Potential Impacts

The proposed amendments to the Procedure are not expected to cause a noticeable change in California employment and payroll. As previously noted, participation in the program is voluntary.

Also, the proposed amendments to the Procedure should not impact the status of California business. However, the amendments may have a slight positive effect on business expansion since companies will be able to introduce their products into the marketplace at an accelerated rate.

The proposed amendments to the Procedure should have no impact on the ability of California's businesses to compete with businesses in other states. Staff's proposals do not change the voluntary nature of the Procedure or its applicability to all businesses that manufacture or market diesel emission control systems regardless of their geographical location.

The proposed amendments to the Procedure should 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.

XII. REFERENCES

1. Air Resources Board 2000. Air Resources Board. October 2000. "Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles". pp. 25-30.

2. Lloyd and Cackette, 2001. Lloyd, A.C. and Cackette, T.A. June 2001. "Diesel engines: Environmental impact and control," Journal of the Air & Waste Management Association, Volume 51, pp. 809-847.

3. International Organization for Standardization, 1996. "Reciprocating internal combustion engines – Exhaust emission measurement Part 4: Test Cycles for different engine applications." Reference number ISO 8178-4:1996(E)

4. U.S. EPA, 2004. Environmental Protection Agency. May 2004. "Final Regulatory Analysis: Control of Emissions from Nonroad Diesel Engines". pp. 4-111 – 4-153

5. ARB 2006. Air Resources Board (ARB) Staff Report: Initial Statement of Reasons – Proposed Amendments to the Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines. February 3, 2006.

6. Conway et al, 2005. Conway, R., Chatterjee, S., Beavan, A., Lavenius, M., Viswanathan, S., Walker, A., and Rawson, S. Society of Automotive Engineers, 2005. "Combined SCR and DPF Technology for Heavy Duty Diesel Retrofit," SAE 2005-01-1862.

7. U.S. EPA, 2003. US EPA, Environmental Technology Verification Protocol, "Generic Verification Protocol for Determination of Emissions Reductions from Selective Catalytic Reduction Control Technologies for Highway, Nonroad, and Stationary Use Diesel Engines," Revision No. 06, September 2003.

APPENDIX A: PROPOSED REGULATION ORDER

Chapter 14. Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines

Amend Sections 2700, 2701, 2702, 2703, 2704, 2705, 2706, 2708, 2709, 2710, Title 13, California Code of Regulations, to read as follows:

Note: The pre-existing regulation text is set forth below in normal type. The amendments are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions. Asterisks indicates no change to existing regulation.

§ 2700. Applicability.

These procedures apply to in-use strategies which, through the use of sound principles of science and engineering, control emissions of particulate matter (PM) and oxides of nitrogen (NOx) from diesel-fueled diesel engines. These strategies may include but are not limited to, diesel particulate filters, diesel oxidation catalysts, fuel additives, selective catalytic reduction systems, exhaust gas recirculation systems, and alternative diesel fuels. To be verified under these procedures, a strategy must either reduce emissions of PM or both PM and NOx. A strategy that reduces emissions of NOx alone may be verified only for use with on-road diesel engines certified to a PM emissions standard of 0.01 grams per brake-horsepower hour (g/bhp-hr) or less, or off-road diesel engines certified to a PM emissions standard of 0.03 g/bhp-hr or less. A strategy that reduces emissions of NOx alone may be verified for use with other diesel engines provided that they are not regulated by ARB in-use fleet regulations or Airborne Toxic Control Measures that require PM emissions control, or provided that they would otherwise potentially not be retrofit with PM emission control strategies.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600 and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5 Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

§ 2701. Definitions.

(a) The definitions in Section 1900(b), Chapter 1, Title 13 of the California Code of Regulations are incorporated by reference herein. The following definitions shall govern the provisions of this chapter:

(1) "15 ppmw or less sulfur fuel" means diesel fuel with a sulfur content equal to or less than 15 parts per million by weight (ppmw).

(2) "Advertise" means to provide any notice, announcement, information,

publication, catalog, listing for sale or lease, or other statement concerning a product or service to the public for the purpose of furthering the sale or lease of the product or service.

~~(2)~~ (3) "Alternative Diesel Fuel" means any fuel used in diesel engines that is not commonly or commercially known, sold or represented as diesel fuel No. 1-D or No. 2-D, pursuant to the specifications in ASTM Standard Specification for Diesel Fuel Oils D975-81 and does not require engine or fuel system modifications for the engine to operate, although minor modifications (e.g. recalibration of the engine fuel control) may enhance performance. Examples of alternative diesel fuels include, but are not limited to, biodiesel, Fischer Tropsch fuels, and emulsions of water in diesel fuel. Natural gas is not an alternative diesel fuel. An emission control strategy using a fuel additive will be treated as an alternative diesel fuel based strategy unless:
(A) The additive is supplied to the vehicle or engine fuel by an on-board dosing mechanism, or
(B) The additive is directly mixed into the base fuel inside the fuel tank of the vehicle or engine, or
(C) The additive and base fuel are not mixed until vehicle or engine fueling commences, and no more additive plus base fuel combination is mixed than required for a single fueling of a single engine or vehicle.

~~(3)~~ (4) "Approach Light System with Sequenced Flasher Lights in Category 1 and Category 2 Configurations" (ALSF-1 and ALSF-2) mean high intensity approach lighting systems with sequenced flashers used at airports to illuminate specified runways during category II or III weather conditions, where category II means a decision height of 100 feet and runway visual range of 1,200 feet, and category III means no decision height or decision height below 100 feet and runway visual range of 700 feet.

~~(4)~~ (5) "Applicant" means the entity that has applied for or has been granted verification under this Procedure.

~~(5)~~ (6) "Auxiliary Emission Control Device" (AECD) means any device or element of design that senses temperature, vehicle speed, engine revolutions per minute (RPM), transmission gear, manifold vacuum, or any other parameter for the purpose of activating, modulating, delaying, or deactivating the operation of the emission control system.

~~(6)~~ (7) "Average" means the arithmetic mean.

~~(7)~~ (8) "Backpressure Monitor" means a device that includes a sensor for measuring the engine backpressure upstream of a hardware-based diesel emission control system or component thereof installed in the exhaust system and an indicator to notify the operator when the backpressure exceeds specified high and in some cases low backpressure limits, as defined by the engine manufacturer or the applicant for verification of a diesel emission control strategy.

~~(8)~~ (9) "Baseline" means the test of a vehicle or engine without the diesel emission control strategy implemented.

~~(9)~~ (10) "Cold Start" means the start of an engine only after the engine oil and water temperatures are stabilized between 68 and 86 degrees Fahrenheit for a minimum of 15 minutes.

~~(10)~~ (11) "Diesel emission control strategy" or "Diesel emission control system" means any device, system, or strategy employed with an in-use diesel vehicle or piece of equipment that is intended to reduce emissions. Examples of diesel emission control strategies include, but are not limited to, particulate filters, diesel oxidation catalysts, selective catalytic reduction systems, fuel additives used in combination with particulate filters, alternative diesel fuels, and combinations of the above.

~~(11)~~ (12) "Diesel Emission Control Strategy Family Name." See Section 2706~~(g)~~ (j) (2).

~~(12)~~ (13) "Diesel Engine" means an internal combustion engine with operating characteristics significantly similar to the theoretical diesel combustion cycle. The primary means of controlling power output in a diesel cycle engine is by limiting the amount of fuel that is injected into the combustion chambers of the engine. A diesel cycle engine may be petroleum-fueled (i.e., diesel-fueled) or alternate-fueled.

(14) "Distributor" means any person or entity to whom a diesel emission control strategy is sold, leased or supplied for the purposes of resale or distribution in commerce.

~~(13)~~ (15) "Durability" means the ability of the applicant's diesel emission control strategy to maintain a level of emissions below the baseline and maintain its physical integrity over some period of time or distance determined by the Executive Officer pursuant to these regulations. The minimum durability testing periods contained herein are not necessarily meant to represent the entire useful life of the diesel emission control strategy in actual service.

~~(14)~~ (16) "Emergency Standby Engine" means a diesel engine operated solely for emergency use, except as otherwise provided in airborne toxic control measures adopted by the ARB.

~~(15)~~ (17) "Emergency Use" means using a diesel engine to provide electrical power or mechanical work during any of the following events and subject to the following conditions:

(A) The failure or loss of all or part of normal electrical power service or normal natural gas supply to the facility,

(B) The failure of a facility's internal power distribution system,

(C) The pumping of flood water or sewage to prevent or mitigate a flood or sewage overflow,

(D) The pumping of water for fire suppression or protection,

(E) The powering of ALSF-1 and ALSF-2 airport runway lights under category II or III weather conditions,

(F) Other conditions as specified in airborne toxic control measures adopted by the ARB.

~~(16)~~ (18) "Emission control group" means a set of diesel engines and applications determined by parameters that affect the performance of a particular diesel emission control strategy. The exact parameters depend on the nature of the diesel emission control strategy and may include, but are not limited to, certification levels of engine emissions, combustion cycle, displacement, aspiration, horsepower rating, duty cycle, exhaust temperature profile, and fuel composition. Verification of a diesel emission control strategy and the extension of existing verifications are done on the basis of emission control groups.

(19) "End user" means any individual or entity that owns or operates a vehicle or piece of equipment that has a verified diesel emission control system installed.

~~(17)~~ (20) "Executive Officer" means the Executive Officer of the Air Resources Board or the Executive Officer's designee.

~~(18)~~ (21) "Executive Order" means the document signed by the Executive Officer that specifies the verification level of a diesel emission control strategy for an emission control group and includes any enforceable conditions and requirements necessary to support the designated verification.

~~(19)~~ (22) "Fuel Additive" means any substance designed to be added to fuel or fuel systems or other engine-related systems such that it is present in-cylinder during combustion and has any of the following effects: decreased emissions, improved fuel economy, increased performance of the entire vehicle or one of its component parts, or any combination thereof; or assists diesel emission control strategies in decreasing emissions, or improving fuel economy or increasing performance of a vehicle or component part, or any combination thereof. Fuel additives used in conjunction with diesel fuel may be treated as an alternative diesel fuel. See Section 2701 (a)~~(2)~~ (3) .

~~(20)~~ (23) "Hot Start" means the start of an engine within four hours after the engine is last turned off. The first hot start test run should be initiated 20 minutes after the cold start for Federal Test Procedure testing following Section 86.1327-90 of the Code of Federal Regulations, Title 40, Part 86.

(24) "Installer" means any individual or entity that equips any vehicle, engine or equipment with a diesel emission control strategy.

~~(21)~~ (25) "Portable Engine" means an engine designed and capable of being carried or moved from one location to another, except as defined in section 2701(a)~~(24)~~ (29). Engines used to propel mobile equipment o~~f~~r a motor vehicle of any kind are not portable. Indicators of portability include, but are not limited to, wheels, skids, carrying handles, dolly, trailer, or platform. A portable engine cannot remain at the same facility location for more than 12 consecutive rolling months or 365 rolling days, whichever occurs

first, not including time spent in a storage facility. If it does remain at the facility for more than 12 months, it is considered to be a stationary engine. The definitions in Title 13 California Code of Regulations section 2452(g) and section 2452(x) are incorporated by reference herein.

~~(22)~~ (26) "Regeneration", in the context of diesel particulate filters, means the periodic or continuous combustion of collected particulate matter that is trapped in a particulate filter through an active or passive mechanism. Active regeneration requires a source of heat other than the exhaust itself to regenerate the particulate filter. Examples of active regeneration strategies include, but are not limited to, the use of fuel burners and electrical heaters. Passive regeneration does not require a source of heat for regeneration other than the exhaust stream itself. Examples of passive regeneration strategies include, but are not limited to, the use of fuel additives and the catalyst-coated particulate filter. In the context of NOx reduction strategies, "regeneration" means the desorption and reduction of NOx from NOx adsorbers (or NOx traps) during rich operation conditions.

~~(23)~~ (27) "Revoke" means to cancel the verification status of a diesel emission control strategy. If a diesel emission control strategy's verification status is revoked by the Executive Officer, the applicant must immediately cease and desist selling the diesel emission control strategy to end-users.

(28) "Seller" means any person or entity that sells, leases or supplies a diesel emission control strategy.

~~(24)~~ (29) "Stationary Engine" means an engine that is designed to stay in one location, or remains in one location. An engine is stationary if any of the following are true:

(A) The engine or its replacement is attached to a foundation, or if not so attached, will reside at the same location for more than 12 consecutive months. Any engine that replaces engine(s) at a location, and is intended to perform the same or similar function as the engine(s) being replaced, will be included in calculating the consecutive time period. In that case, the cumulative time of all engine(s), including the time between the removal of the original engine(s) and installation of the replacement engine(s), will be counted toward the consecutive time period; or

(B) The engine remains or will reside at a location for less than 12 consecutive months if the engine is located at a seasonal source and operates during the full annual operating period of the seasonal source, where a seasonal source is a stationary source that remains in a single location on a permanent basis (at least two years) and that operates at that single location at least three months each year; or

(C) The engine is moved from one location to another in an attempt to circumvent the residence time requirements [Note: The period

during which the engine is maintained at a storage facility shall be excluded from the residency time determination.] The definitions in Title 13 California Code of Regulations Section 2452(g) and Section 2452(x) are incorporated by reference herein.

~~(25)~~ (30) "Verification" means a determination by the Executive Officer that a diesel emission control strategy meets the requirements of this Procedure. This determination is based on both data submitted or otherwise known to the Executive Officer and engineering judgement.

(31) "Warrantable condition" means any condition of the diesel emission control strategy, vehicle, or engine which triggers the responsibility of the applicant to take corrective action pursuant to Section 2707.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600 and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

§ 2702. Application Process.

(a) Overview. Before submitting a final ~~formal~~ application for the verification of a diesel emission control strategy for use with an emission control group, the applicant must submit a ~~proposed verification testing protocol~~ preliminary verification application (pursuant to Section 2702(b)) at the Executive Officer's discretion in the format shown in 2702(d). To obtain verification, the applicant must conduct emission reduction testing (pursuant to Section 2703), durability testing (pursuant to Section 2704), a field demonstration (pursuant to Section 2705), and submit the results along with comments and other information (pursuant to Sections 2706 and 2707) in ~~an~~ final verification application to the Executive Officer, in the format shown in Section 2702(d). If the Executive Officer grants verification of a diesel emission control strategy, it will issue an Executive Order to the applicant identifying the verified emission reduction and any conditions that must be met for the diesel emission control strategy to function properly. After the Executive Officer grants verification of a diesel emission control strategy, the applicant must provide a warranty, conduct in-use compliance testing of the strategy after having sold or leased a specified number of units, and report the results to the Executive Officer (pursuant to Section 2709). A diesel emission control strategy that employs two or more individual systems or components must be tested and submitted for evaluation as one system. A verified diesel emission control strategy may not be installed on an engine with another diesel emission control strategy that is not included in the Executive Order. Applicants seeking verification of an alternative diesel fuel must follow the procedure described in Section 2710.

(b) ~~Proposed Verification Testing Protocol~~ Preliminary Verification Application. Before formally submitting a~~n~~ final application for the ~~initial~~ verification of a diesel emission control strategy, the applicant must submit a ~~proposed verification testing protocol~~ preliminary verification application at the Executive Officer's discretion. The Executive Officer shall use the information in the ~~proposed protocol~~ preliminary verification application to help determine whether the strategy relies on sound principles of science and engineering to control emissions, the need for additional analyses, and the appropriateness of allowing alternatives to the prescribed requirements. The ~~protocol~~ preliminary verification application must follow the format shown in Section 2702(d) and at a minimum provide the information required in sections 1 through 5 and section 8.A.A.5, where applicable. In addition, the preliminary verification application must ~~should~~ include the following information:

(1) Identification of the contact persons, phone numbers, names and addresses of the responsible party ~~proposing to~~ submitting the preliminary verification ~~an~~ application.

(2) Description of the diesel emission control strategy's principles of operation. A schematic depicting operation ~~should~~ must be included ~~as appropriate~~. It is the responsibility of the applicant to demonstrate that its product relies on sound principles of science and engineering to achieve emission reductions.

(A) If, after reviewing the ~~proposed protocol~~ preliminary verification application, the Executive Officer determines that the applicant has not made a satisfactory demonstration that its product (diesel emission control strategy) relies on sound principles of science and engineering to achieve emission reductions, the Executive Officer shall notify the applicant of the determination in writing within 30 days of receiving the preliminary verification application. The applicant may choose to withdraw from the verification process or submit additional materials and clarifications. The additional submittal must be received by the Executive Officer no later than 60 days from the date of the notification letter or the application may be suspended.

(B) If, after reviewing the additional submittal, the Executive Officer determines that the applicant has not yet made a satisfactory demonstration that its product relies on sound principals of science and engineering to achieve emission reductions, the preliminary verification application shall be suspended. If a~~n~~ preliminary verification application has been suspended, it may only be reactivated at the discretion of the Executive Officer.

(C) If at any time, the Executive Officer has reason to doubt the scientific or engineering soundness of a product, the Executive Officer shall notify the applicant in writing and may require the applicant to submit additional supporting materials and clarifications no later than 60 days from the date of the notification

letter. If the additional submittal is not received by the Executive Officer by the deadline established in the notification letter, the preliminary or final application may be suspended or the existing verification may be revoked. In deciding whether to suspend ~~an~~ preliminary or final application or revoke an existing verification the Executive Officer will review submittals as provided in subsection (B) above.

(3) Preliminary parameters for defining emission control groups that are appropriate for the diesel emission control strategy. The Executive Officer will work with the applicant to determine appropriate emission control group parameters.

(4) The applicant's proposed test plan for meeting the requirements of Sections 2702-2706. Existing test data may be submitted for the Executive Officer's consideration. The ~~protocol~~ preliminary verification application must focus on verification of the diesel emission control strategy for use with a single emission control group.

(5) A brief statement that the applicant acknowledges and agrees to do the following:

(A) Provide a warranty pursuant to the requirements of Section 2707.

(B) Submit in-use compliance information pursuant to the requirements of Section 2709.

(C) Keep records until the in use compliance requirements are completed that contain information per Section 2702 (m) including:

1. Updated end user contact information.
2. A description of the vehicles or equipment on which the applicant's products are installed.
3. A description of the engines on which the applicant's products are installed.

(c) ~~If~~ When an applicant submits a ~~proposed verification testing protocol~~ preliminary verification application, the Executive Officer shall, within 30 days of its receipt, determine whether the applicant has identified ~~an appropriate testing protocol~~ the information necessary to support an application for verification and notify the applicant in writing that it may submit an application for verification. The Executive Officer may suggest modifications to the proposed ~~verification testing protocol~~ preliminary verification application to facilitate verification of the diesel emission control strategy. All applications, correspondence, and reports must be submitted in writing to:

Chief, Heavy-Duty Diesel In-Use Strategies Branch
Air Resources Board
~~9528 Telstar Avenue~~
~~El Monte, CA 91731~~
1001 I Street
Sacramento, CA 95814

(d) Application Format. The preliminary and final verification applications must be submitted in writing to the address shown in subsection (c) above. Electronic mail and verbal submissions do not constitute acceptable application formats. Supporting data in electronic format may be accepted as part of the application at the discretion of the Executive Officer. The preliminary and final verification applications for ~~verification of~~ a diesel emission control strategy must follow the format shown below. If a section asks for information that is not applicable to the diesel emission control strategy, the applicant must indicate "not applicable." If the Executive Officer concurs with the applicant's judgement that a section is not applicable, the Executive Officer may waive the requirement to provide the information requested in that section. Final verification applications must include all of the information provided in the preliminary verification application as described in Section 2702(b), including any additional information, updates, or changes, and all additional information shown below.

1. ~~Introduction~~ *Introduction*
   - 1.1 Identification of applicant, manufacturer, and product
   - 1.2 Identification of type of verification being sought
     - 1.2.1 Description of emission control group selected
     - 1.2.2 Emission reduction claim
     - 1.2.3 Description of intended applications (examples of in-use vehicles or equipment, typical duty cycles, fuel requirements, etc.)

2. ~~Diesel Emission Control Strategy Information~~ *Diesel Emission Control Strategy Information*
   - 2.1 General description of the diesel emission control strategy
     - 2.1.1 Detailed ~~D~~discussion of principles of operation and system design
     - 2.1.2 Description of inducement method if applicable
     - 2.1.3 Schematics depicting operation (as appropriate)
     - 2.1.3 A list identifying all the parts of the diesel emission control strategy as described in Section 2706(o)
   - 2.2 Description of regeneration method
     - 2.2.1 Operating condition requirements for regeneration
     - 2.2.2 Thresholds and control logic to activate regeneration
     - 2.2.3 Description of backpressure monitor including thresholds and control logic

2.3 Favorable operating conditions
2.4 Unfavorable operating conditions and associated reductions in performance
2.5 Fuel and lubricating oil requirements and misfueling considerations
2.6 Identification of failure modes and associated consequences
2.7 Complete discussion of potential safety issues *(e.g., uncontrolled regeneration, lack of proper maintenance, unfavorable operating conditions, etc.)*
2.8 Installation requirements
2.9 Maintenance requirements
2.9.1 Detailed description of all normal maintenance requirements for the diesel emission control system
2.9.2 A copy of the language that will instruct the end user of proper handling of spent components and/or materials cleaned from the diesel emission control system, identify any hazardous materials, and provide procedures for resetting any backpressure monitors after maintenance procedures are completed.
2.10 Description of noise level control compliance

3. ~~Alternative Diesel Fuel Information~~ *Alternative Diesel Fuel and Fuel Additive Information*.
(Use of an alternative diesel fuel/fuel additive requires a multimedia evaluation as required by Section 43830.8 California Health and Safety Code)
3.1 Additional ~~i~~information from Section 2710(b), 2710(c), 2710(f), and 2710(g)
3.2 Emission control group compatibility considerations
3.3 Misfueling prevention strategies
3.4 Multimedia evaluation
3.4.1 Additional test data and information required for multimedia evaluation

4. *Diesel Emission Control Strategy and Emission Control Group Compatibility*
4.1 Compatibility with the engine
4.1.1 Discussion on calibrations and design features that may vary from engine to engine
4.1.2 Effect on overall engine performance
4.1.3 Effect on engine backpressure
4.1.4 Additional load on the engine
4.1.5 Effect on fuel consumption
4.1.6 Engine oil consumption considerations
4.2 Compatibility with the application
4.2.1 Dependence of calibration and other design features on application characteristics
4.2.2 Presentation of typical exhaust temperature profiles and other relevant field-collected data from representative applications within the emission control group

4.2.3 Comparison of field-collected application data with operating conditions suitable for the diesel emission control strategy

5. *Testing Information*

5.1 Emission reduction testing

5.1.1 Test facility identification including capabilities and identification of all analytical instruments

5.1.2 Description of test vehicle and engine *(make, model year, engine family name, PM and NOx certification levels if applicable, etc.)*

5.1.3 Statement indicating whether the test engine is in a proper state of maintenance, and/or has been rebuilt or modified from the original engine manufacturer configuration

5.1.4 Description of test fuel

5.1.5 Discussion of effects of elevated NOx emissions on diesel emission control strategy (effects on emission reduction performance, durability, safety, and control strategy response)

~~5.1.3~~ 5.1.6 Test procedure description *(-pre-conditioning period, test cycle, etc.)*

~~5.1.4~~ 5.1.7 Test results and comments

5.1.8 Incomplete and aborted test data and explanations

5.2 Durability testing

5.2.1 Test facility identification including capabilities and identification of all analytical instruments

5.2.2 Description of field application (where applicable)

5.2.3 Description of test vehicle and engine *(make, model year, engine family name, PM and NOx certification levels if applicable, etc.)*

5.2.4 Analysis of emissions test fuel

5.2.5 Analysis of durability test fuel

~~5.2.4~~ 5.2.6 Test procedure description *(field or bench, test cycle, etc.)*

5.2.7 Test Procedure demonstrating durability of monitoring and notification system

5.2.8 Description of maintenance during durability testing

~~5.2.5~~ 5.2.9 Test results and comments

~~5.2.6~~ 5.2.10 Summary of evaluative comments from third-party for in-field durability demonstration *(e.g., driver or fleet operator)*

5.3 Field demonstration (where applicable)

5.3.1 Field application identification

5.3.2 Description of test vehicle and engine *(make, model year, engine family name, PM and NOx certification levels if applicable, etc.)*

5.3.3 Engine backpressure and exhaust temperature graphs with comments

5.3.4 Summary of evaluative comments from third-party *(e.g., driver or fleet operator)*

5.3.5 Description of test failures

6. *Warranty and In-Use Compliance Requirements*
   6.1 Statement that the applicant agrees to provide annual warranty reports and to follow the warranty requirements per Section 2707
   6.2 Statement that the applicant agrees to follow the in-use compliance requirements per Section 2709
   6.3 Statement that the applicant agrees to keep the required end user information per Section 2702(m)

~~6.~~ 7. *References*

~~7.~~ 8. *Appendices*
   A. Laboratory test report information *(for all tests, including incomplete, aborted and failed tests)*
      A.1 Actual laboratory test data
      A.2 Plots of engine backpressure and exhaust temperature
      A.3 Driving traces for chassis dynamometer tests
      A.4 Quality assurance and quality control information
      A.5 Testing equipment information and indication that testing equipment meets specifications and calibrations given in the Code of Federal Regulations, Title 40, Part 86 (See Sections 2703(m), 2706(a)(2))
   B. Third-party letters or questionnaires describing in-field performance
   C. Diesel emission control system label
   D. Copy of the Owner's manual (as described in Section 2706 ~~(i)~~ (l))
   E. Copy of the Installation Manual
   F. Sample diesel emission control system label (See Section 2706(j))
   ~~E~~.G. Other supporting documentation

(e) Within 30 days of receipt of the preliminary application, the Executive Officer shall notify the applicant whether the application is complete.

(f) Within 60 days after ~~an~~ final application has been deemed complete, the Executive Officer shall determine whether the diesel emission control strategy merits verification and shall classify it as shown in Table 1:

Table 1. Verification Classifications for Diesel Emission Control Strategies

Pollutant	Reduction	Classification
PM	< 25%	Not verified
		Level 0* (see note below)
	≥ 25%	Level 1
		Level 1 Plus**
	≥ 50%	Level 2
		Level 2 Plus**
	≥ 85%, or ≤ 0.01 g/bhp-hr	Level 3
		Level 3 Plus**
NOx	< ~~15%~~ 25%	Not verified
	~~≥ 15%~~ ≥ 25%	~~Verified in 5% increments~~ Mark 1
	≥ 40%	Mark 2
	≥ 55%	Mark 3
	≥ 70%	Mark 4
	≥ 85%	Mark 5

*A diesel emission control strategy that reduces emissions of PM by less than 25 percent may be verified as a Level 0 strategy if it reduces emissions of NOx by at least 25 percent and meets the other criteria in section 2700.

**The diesel emission control strategy complies with the 20 percent NO_2 limit before January 1, 2009 (and after January 1, 2007).

The applicant and the Executive Officer may mutually agree to a longer time period for reaching a decision, and additional supporting documentation may be submitted by the applicant before a decision has been reached. The Executive Officer shall notify the applicant of the decision in writing and specify the verification level for the diesel emission control strategy and identify any terms and conditions that are necessary to support the verification.

* * * * *

(h) Conditional Extensions of an Existing Verification for On-road Applications. If an applicant has an ARB verified diesel emission control strategy and wishes to extend the verification to include new on-road emission control groups, the applicant may apply to receive a conditional

extension. If the Executive Officer determines that the diesel emission control strategy is technologically sound and appropriate for the intended application, the applicant may be granted a conditional extension for up to one year. Upon receiving a conditional extension, the applicant may sell the diesel emission control strategy as a verified product for the duration of the conditional extension period. To obtain full verification, the applicant must complete the requirements set forth by the Executive Officer. In granting a conditional extension, the Executive Officer may consider all relevant information including, but not limited to, the following: the design of the diesel emission control strategy, original test data, other relevant test data, the duty cycle of the prospective emission control group, and field experience. For the time period it is effective, a conditional extension is equivalent to a verification for the purposes of satisfying the in-use compliance requirements. Emission control strategies that are conditionally verified for off-road and stationary applications are not eligible for conditional extensions (See Section 2704(k)).

~~(h)~~ (i) Design Modifications. If an applicant modifies the design of a diesel emission control strategy that has already been verified or is under consideration for verification by the Executive Officer, the modified version must be evaluated under this Procedure. The applicant must provide a detailed description of the design modification along with an explanation of how the modification will change the operation and performance of the diesel emission control strategy. To support its claims, the applicant must submit additional test data, engineering justification and analysis, or any other information deemed necessary by the Executive Officer to address the differences between the modified and original designs. Processing time periods follow sections (e) and (f) above.

(j) Verification Transfers. If an applicant wishes to sell, lease, or supply another manufacturer's previously verified diesel emission control system, the applicant must do the following:

(1) Submit a letter of consent from the manufacturer that legally holds the original verification. The letter must give the applicant the right to hold a verification for the diesel emission control system and, if applicable, to use information that was previously submitted as support in the application for the original verification.

(2) Submit an application(s) per Section 2702 of this Procedure. If previously submitted information is included, necessary additional information must be submitted that satisfies all applicable requirements of this Procedure (e.g. testing data, warranty statement, label, owner's manual, etc.).

(3) Submit a description of the diesel emission control strategy's principles of operation. The applicant must demonstrate understanding of how the product relies on sound principles of science and engineering to achieve emissions reductions.

(k) Emission Control Systems Approved under Other Verification Programs. Any applicant with a diesel emission control system that is verified under another diesel emission control verification program that wishes to receive ARB verification must submit an application that contains the information requested in part (d) above. Pre-existing data and information submitted in support of verification approval from other programs may be submitted, but the applicant must meet requirements that are unique to this Procedure including, but not limited to, a system label compliant with Section 2706(j), a California owner's manual compliant with Section 2706(l), a warranty compliant with Section 2707, in-use compliance requirements per Section 2709, and multimedia evaluation if applicable. The Executive Officer may evaluate all information submitted including additional information required by this Procedure to determine if a diesel emission control strategy merits ARB verification.

~~(i)~~ (l) Treatment of Confidential Information. Information submitted to the Executive Officer by an applicant may be claimed as confidential, and such information shall be handled in accordance with the procedures specified in Title 17, California Code of Regulations, Sections 91000-91022. The Executive Officer may consider such confidential information in reaching a decision on a verification application.

(m) Applicants that receive verifications, conditional verifications, or conditional extensions must keep records that have valid end user contact information (name, address, phone number), a description of the vehicles or equipment the units are applied to (type of vehicle/equipment, make, model year, vehicle identification number), and a description of the engines the units are applied to (make, model, model year, engine serial number, engine family name). The applicant must keep these records for each diesel emission control strategy family until the in-use compliance requirements of the diesel emission control strategy family are completed. Applicants that receive conditional extensions or conditional verifications must submit these records to the Executive Officer one year after receiving the conditional extension or conditional verification. Applicants that receive verifications must submit these records upon request by the Executive Officer to an agent or employee of ARB. The Executive Officer may request that such records be made available at any time. The applicant must provide these records within 30 days of the request by the ARB. Failure to submit these records may result in revocation or suspension of the verification and/or any other remedy available under Part 5, Division 26 of the Health and Safety Code.

(n) The Executive Officer may at any time with respect to any diesel emission control strategy sold, leased, offered for sale, intended for sale, or manufactured for sale in California, order the applicant or manufacturer to submit records pertaining to the diesel emission control strategy, at the applicant's expense, to a location specified by the Executive Officer.

(o) Applicants that receive verifications, conditional verifications, or conditional extensions must demonstrate sales or the active pursuit of sales of their diesel emission control systems in California upon request of the Executive Officer. If an applicant fails to provide such proof, the Executive Officer will evaluate whether the verification should be revoked.

(p) The Executive Officer may, with respect to any diesel emission control strategy sold, leased, offered for sale, intended for sale, or manufactured for sale in California, order the applicant or strategy manufacturer to make available for testing and/or inspection a reasonable number of diesel emission control systems, and may direct that they be delivered at the applicant's expense to the state board at the Haagen-Smit Laboratory, 9528 Telstar Avenue, El Monte, California or where specified by the Executive Officer. The Executive Officer may also, with respect to any diesel emission control strategy being sold, leased, offered for sale, intended for sale, or manufactured for sale in California, have an applicant test and/or inspect under the supervision of the Executive Officer a reasonable number of units at the applicant's or manufacturer's facility or at any test laboratory accepted by the Executive Officer. All such testing and inspection is confirmatory in nature. If the Executive Officer finds performance that is not consistent with either an existing or requested verification, the applicant must address and resolve the inconsistency to the satisfaction of the Executive Officer in order to maintain or receive verification. Any testing and inspection done by ARB cannot be used as a substitute for emissions test data or other support required in an application for verification.

~~(j)~~ (q) The Executive Officer may lower the verification level or revoke the verification status of a verified diesel emission control strategy family, a conditionally verified system, or a system with a conditional extension or suspend all review of pending verification applications if the Executive Officer determines that there are errors, omissions, ~~or~~ inaccurate information, fraudulent submittals, or a deficiency of required submittals in the application for verification, ~~or~~ supporting information, warranty report, or in-use compliance testing. Additionally, penalties may be assessed under Part 5, Division 26 of the Health and Safety Code. The Executive Officer may suspend the review of all other applications sent by an applicant if that applicant fails to submit warranty reports or other requested information. The Executive Officer may also seek remedial action against the applicant if it is determined that the verified diesel emission control strategy does not comply with the requirements or provisions of the Executive Order.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600 and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018,

43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

§ 2703. Emission Testing Requirements.

* * * *

(d) Test Fuel.

(1) The test fuel must meet the specifications in the California Code of Regulations (Sections 2280 through 2283 of Title 13), with the exception of the sulfur content or other properties previously identified by the applicant and approved by the Executive Officer. The Executive Officer may approve test fuel(s) that do not comply with Sections 2280 through 2283 of Title 13 of the California Code of Regulations if the fuel(s) are determined to be, based on sound science and engineering, representative of commercially available fuel typically used for the intended application(s).

(e) Test Cycle. The diesel emission control strategy must be tested using the test cycles indicated in subparagraphs 1-3 below (summarized in Table 2) or with an alternative cycle(s) approved by the Executive Officer pursuant to subsection (f) below. The Executive Officer may require the applicant to conduct additional testing if such information is necessary for a complete evaluation of the control technology.

Table 2. Test Cycles for Emission Reduction Testing*

Test Type	On-Road	Off-Road (including portable engines)	Stationary
Engine	FTP Heavy-duty Transient Cycle (1 cold-start and 3 hot-starts)	Steady-state test cycle from ARB off-road regulations until December 31, 2008 with Executive Officer approval, otherwise;Transient test cycle from ARB off-road regulations (3 hot-starts either cycle)	~~Steady-state~~ Discrete mode test cycle from ARB off-road regulations (3 hot-starts)
Chassis	UDDS (3 hot-starts) and a low-speed test cycle per 2703 (e)(1)(B)~~(ii)~~2. (3 hot-starts).	Not Applicable	Not Applicable

~~* Additional hot-starts are required for NOx emission reductions between 15 to 25 percent (see Section 2703(h)).~~

FTP = Federal Test Procedure; UDDS = Urban Dynamometer Driving Schedule

(1) On-road Engines and Vehicles. For on-road diesel-fueled vehicles, the applicant may choose between engine dynamometer testing and chassis dynamometer testing, subject to the following conditions. Engine testing may be used for verification of an absolute engine emissions level or a percent emission reduction. Chassis testing may be used only to verify a percent emission reduction. The applicant may use emission test data to satisfy the durability test data requirement, but must follow the same testing option for the remaining durability tests (see Section 2704).

(A) Engine testing must consist of one cold-start and at least three hot-start tests using the Federal Test Procedure (FTP) Heavy-duty Transient Cycle for engines used in on-road applications, in accordance with the provisions in the Code of Federal Regulations, Title 40, Part 86, Subpart N.

(B) The applicant must conduct all chassis tests in accordance with the provisions of the Code of Federal Regulations, Title 40, Part 86, Subpart N insofar as they pertain to chassis dynamometer testing. Chassis testing must include two separate test cycles as follows:

1. At least three hot-start tests using the Urban Dynamometer Driving Schedule (UDDS) (see Code of Federal Regulations, Title 40, Part 86, appendix I (d)).

* * * * * *

3. The driver must follow the test cycles as closely as possible and must not deviate beyond the following tolerances (See Code of Federal Regulation, Part 86, Subpart M, 86.1215-85).

~~(i)~~ a. The upper limit is 4 miles per hour higher than the highest point on the trace within 1 second of the given time.

~~(ii)~~ b. The lower limit is 4 miles per hour lower than the lowest point on the trace within 1 second of the given time.

~~(iii)~~ c. Speed variations greater than the tolerances (such as may occur during gear changes or braking spikes) are acceptable, provided they occur for less than 2 seconds on any occasion and are clearly documented as to the time and speed at that point of the test cycle.

~~(iv)~~ d. Speeds lower than those prescribed are acceptable, provided the vehicle is operated at maximum available power during such occurrences.

* * * * *

(C) For any diesel emission control strategy intended to reduce NOx from on-road applications, the ~~following requirements apply: (i) The~~ applicant must identify and discuss the effects of elevated NOx emissions on the diesel emission control strategy (emissions of NOx that are significantly greater than certified levels are said to be elevated, and may result, for example, from the activation of an AECD that advances fuel injection timing under cruise conditions). The applicant's discussion must include effects on emission reduction performance, durability, and safety considerations, how the strategy would respond to elevated NOx emissions that do not occur at the time the strategy is calibrated, and must be supported by engineering justification and any pertinent data. ~~(ii) The applicant must perform three hot-start tests with an additional test cycle that gives rise to significant periods of elevated NOx emissions, except as provided below.~~

~~1. The applicant may request that the Executive Officer provide assistance with determining an engine or chassis test cycle or may propose a test cycle for approval by the Executive Officer. The Executive Officer will evaluate the proposed test cycle based on its representativeness of real-life operation and consistency with established procedures for determining off-cycle emissions.~~

~~2. The applicant may request that the Executive Officer waive the requirement to conduct this additional testing. In reviewing the request, the Executive Officer may consider all relevant information including, but not limited to, the principles of operation of the diesel emission control strategy and the availability of an appropriate test cycle.~~

(2) Off-road Engines and Equipment (including portable engines). For off-road diesel-fueled vehicles and equipment, the applicant must follow the ~~steady-state~~ transient test procedures outlined in the ARB off-road regulations (2006 California Code of Regulations, Title 13, Section 2423 and the incorporated California Exhaust Emissions Standards and Test Procedures for New ~~2000~~ 2008 and Later Tier 4 Off-Road Compression-Ignition Engines, Part I-~~B~~C). For all variable speed engines, a~~A~~ minimum of three hot-start tests must be conducted using the ~~specified test~~ Nonroad Transient Composite ~~c~~Cycle (NRTC).

(A) The Executive Officer may require the applicant to follow another test cycle if the Executive Officer determines that it is more representative of the in-use duty cycle of the off-road application for which the applicant seeks verification.

(B) An applicant may follow the steady state test procedure outlined in the ARB off-road regulations (California Code of Regulations, Title 13, Section 2423 and the incorporated California Exhaust Emission Standards and Test Procedures for New 2000 and Later Tier 1, Tier 2, and Tier 3 Off-Road Compression-Ignition Engines, Part I-B) only if the applicant submits a complete preliminary verification application by October 1, 2008 and receives a letter of notification from the Executive Officer, dated no later than December 31, 2008 that the application is complete. In addition, the applicant must submit a complete final verification application that is consistent with the terms of the approved preliminary verification application by July 1, 2010. If the applicant fails to submit a complete final verification application by July 1, 2010, the applicant must test using the NRTC.

(C) An applicant with a system verified after October 19, 2007 using the steady state test procedure outlined in the ARB off-road regulations (California Code of Regulations, Title 13, Section 2423 and the incorporated California Exhaust Emission Standards and Test Procedures for New 2000 and Later Tier 1, Tier 2, And Tier 3 Off-Road Compression-Ignition Engines, Part I-B) must submit emissions test data using the NRTC by January 1, 2013. The Executive Officer will reassess and potentially revise the verification status of the system, claimed emissions reductions, and compliance with NO_2 emissions requirements based on the submitted data. Appropriate testing must include a pre-conditioned unit, an aged unit, and a baseline test. If such data are not received and approved by the Executive Officer by January 1, 2013, the verification will be revoked. A verification awarded prior to October 19, 2007, is not subject to this requirement. A verification for which the Executive Officer determines the NRTC is not appropriate per section 2703(e)(2)(A) is not subject to this requirement.

(D) Applicants may request that the Executive Officer consider alternative test cycles, as described in subsection (f).

(3) Stationary Engines. For stationary engines, the applicant must follow the ~~steady-state~~ discrete mode test procedures outlined in the ARB off-road regulations (as referenced in (2) above). A minimum of three hot-start tests must be conducted using the specified test cycle. Applicants may request that the Executive Officer consider alternative test cycles and methods, as described in subsection (f).

(f) Alternative Test Cycles and Methods. The applicant may request the Executive Officer to approve an alternative test cycle or method in place of a required test cycle or method. In reviewing this request, the Executive Officer ~~may~~ will consider all relevant information including, but not limited to, the following:

(1) Test procedures specified in airborne toxic control measures adopted by the ARB, e.g. the Airborne Toxic Control Measure for Stationary Compression Ignition Engines,

(2) Similarity of average speed, percent of time at idle, average acceleration, and other characteristics to the specified test cycle or method and in-use duty cycle,

(3) Body of existing test data generated using the alternative test cycle or method,

(4) Technological necessity, and

(5) Technical ability to conduct the required test.

(g) Test Run. The number of tests indicated in Table 2 must be run for both baseline (without the diesel emission control strategy implemented) and control configurations. For strategies that include exhaust aftertreatment, engine backpressure and exhaust temperature must be measured and recorded on a second-by-second basis (1 Hertz) during at least one baseline run and each of the control test runs. For strategies that use a chemical reductant to reduce emissions of NOx from on-road or off-road applications, the amount of reductant consumed during each control test run must be measured and recorded.

~~(h) Verification of NOx Emission Reductions. The procedure for verifying NOx reductions depends on the magnitude and nature of the claimed reductions as follows:~~

~~(1) For NOx reductions of 25 percent or more below the baseline NOx emissions, the testing protocol described in (e) may be used.~~

~~(2) For NOx reductions of less than 25 percent below the baseline NOx emissions, additional hot-start test runs are required to attain equivalent confidence in the results.~~

~~(A) For NOx reductions equal to or more than 20 percent, but less than 25 percent, each set of three hot-starts in paragraph (e) above must be augmented to five hot-starts~~

~~(B) For NOx reductions equal to or more than 15 percent, but less than 20 percent, each set of three hot-starts in paragraph (e) above must be augmented to nine hot-starts.~~

~~(i)~~ (h) Emissions During Particulate Filter Regeneration Events. For any diesel emission control strategy that has a distinct regeneration event, emissions that occur during the event must be measured and taken into account when determining the net emission reduction efficiency of the system. If a regeneration event will not occur during emission testing, applicants may pre-load the diesel emission control system with diesel PM to force such an event to occur during testing, subject to the approval of the Executive Officer. Applicants must provide data or engineering analysis indicating when events occur on test cycles and in actual operation (e.g., backpressure data).

~~(j)~~ (i) Results. For all valid emission tests used to support emission reduction claims, the applicant must report emissions of total PM, non-methane hydrocarbons or total hydrocarbons (whichever is used for the relevant engine or vehicle certification), oxides of nitrogen, nitrogen dioxide, carbon monoxide, and carbon dioxide.

(1) For mobile sources, or for engines tested using an engine dynamometer, emissions must be reported in grams/mile (g/mile) or grams/brake horsepower-hour (g/bhp-hr).

(2) For stationary engines, gaseous and particulate matter emissions must be reported as required by the test methods approved by the Executive Officer.

~~(k)~~ (j) Incomplete and Aborted Tests. The applicant must identify all incomplete and aborted tests and explain why those tests were incomplete or aborted.

~~(l)~~ (k) Additional Analyses. The Executive Officer may require the applicant to perform additional analyses if there is reason to believe that the use of a diesel emission control strategy may result in the increase of toxic air contaminants, other harmful compounds, or a change in the nature or amount of the emitted particulate matter.

(1) In its determination, the Executive Officer may consider all relevant data, including but not limited to the following:

(A) The addition of any substance to the fuel, intake air, or exhaust stream,

(B) Whether a catalytic reaction is known or reasonably suspected to increase toxic air contaminants or ozone precursors,

(C) Results from scientific literature,

(D) Field experience, and

(E) Any additional data.

(2) These additional analyses may include, but are not limited to, measurement of the following:

(A) Benzene

(B) 1,3-butadiene
(C) Formaldehyde
(D) Acetaldehyde
(E) Polycyclic aromatic hydrocarbons (PAH)
(F) Nitro-PAH
(G) Dioxins
(H) Furans

(3) The Executive Officer will determine appropriate test methods for additional analyses in consultation with the applicant.

~~(m)~~ (l) Quality Control of Test Data. The applicant must provide information on the test facility, test procedure, and equipment used in the emission testing. For data gathered using on-road and off-road test cycles and methods, applicants must provide evidence establishing that the test equipment used meets the specifications and calibrations given in the Code of Federal Regulations, Title 40, Part 86, subpart N.

~~(n)~~ (m) The Executive Officer may, with respect to any diesel emission control strategy sold, leased, offered for sale, or manufactured for sale in California, order the applicant or strategy manufacturer to make available for testing and/or inspection a reasonable number of diesel emission control systems, and may direct that they be delivered at the applicant's expense to the state board at the Haagen-Smit Laboratory, 9528 Telstar Avenue, El Monte, California or where specified by the Executive Officer. The Executive Officer may also, with respect to any diesel emission control strategy being sold, leased, offered for sale, or manufactured for sale in California, have an applicant test and/or inspect a reasonable number of units at the applicant or manufacturer's facility or at any test laboratory under the supervision of the Executive Officer.

~~(m)~~ (n) Quality Control of Test Data. The applicant must provide information on the test facility, test procedure, and equipment used in the emission testing. For data gathered using on-road and off-road test cycles and methods, applicants must provide evidence establishing that the test equipment used meets the specifications and calibrations given in the Code of Federal Regulations, Title 40, Part 86, subpart N. The testing information must be approved by the Executive Officer.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600 and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5 Health and Safety Code; Title 17 California Code of Regulations Section 93000.

§ 2704. Durability Testing Requirements

* * * * *

(c) Test Fuel.

(1) The test fuel must meet the specifications in the California Code of Regulations (Sections 2280 through 2283 of Title 13), with the exception of the sulfur content or other properties previously identified by the applicant and approved by the Executive Officer. The Executive Officer may approve test fuel(s) that do not comply with Sections 2280 through 2283 of Title 13 of the California Code of Regulations if the fuel(s) are determined to be, based on sound science and engineering, representative of commercially available fuel typically used for the intended application(s).

* * * * *

(d) Service Accumulation. The durability demonstration consists of an extended service accumulation period in which the diesel emission control strategy is implemented in the field or in a laboratory accepted by the Executive Officer, with emission reduction testing before and after the service accumulation. Service accumulation begins after the first emission test and concludes before the final emission test. The pre-conditioning period required in Section 2703 (c) cannot be used to meet the service accumulation requirements.

(1) Minimum Durability Demonstration Periods. The minimum durability demonstration periods are shown in Table 3, below. ~~For strategies that include exhaust aftertreatment, engine backpressure and exhaust temperature must be measured and recorded for 1000 hours or over the entire durability period (whichever is shorter). The applicant may propose a sampling scheme for approval by the Executive Officer. The sampling scheme may include, but is not limited to, logging only significant changes in a parameter, averages, or changes above some threshold value. Data must be submitted electronically in columns as a text file or another format approved by the Executive Officer.~~

Table 3. Minimum Durability Demonstration Periods

Engine Type	Minimum Durability Demonstration Period
On-Road	50,000 miles or 1000 hours
Off-Road (including portable engines) and Stationary	1000 hours
Stationary Emergency Standby Engines	500 hours

(2) Temperature and Backpressure Measurement Requirements. For strategies that include exhaust aftertreatment, engine backpressure and exhaust temperature must be measured and recorded for 1000 hours or over the entire durability period (whichever is shorter). The applicant must propose a measurement and recording protocol for approval by the Executive Officer. The protocol may include, but is not limited to, measurement and recording of values once every few seconds, or higher frequency measurement with recording of averages, minima, and maxima over longer time intervals. Data must be submitted electronically in columns as a text file or another format approved by the Executive Officer.

(3) NOx Emissions Measurement Requirements. For strategies that include exhaust aftertreatment to reduce emissions of NOx, the mass emissions of NOx both upstream and downstream of the aftertreatment device must be measured and recorded for at least the first and last 100 hours of the durability period. The applicant must propose a measurement method for approval by the Executive Officer. The method may include, but is not limited to, the use of NOx sensors before and after the device. Measurements of NOx emissions must occur on at least a 1 Hertz basis. Data must be recorded as averages over time intervals no greater than 10 seconds. Data must be submitted electronically in columns as a text file or another format approved by the Executive Officer.

~~(2)~~ (4) Fuel for Durability Demonstrations. The fuel used during durability demonstrations should be equivalent to the test fuel, or a fuel with properties less favorable to the durability of the emission control strategy. Durability demonstrations may, at the applicant's option and with the Executive Officer's approval, include intentional misfueling events so that data on the effects of misfueling may be obtained.

* * * * *

(g) Test Run. The requirements for emissions reduction testing are summarized in Table 4, below. Note that special pre-conditioning requirements may apply. See section 2706(a)(4) for details.

(1) The diesel emission control strategy must undergo one set of emission tests before beginning and after completion of the service accumulation. Baseline testing with test repetitions as indicated in Table 4 must be conducted ~~for either the initial test or the final test, but is suggested for both.~~ before and after the service accumulation. If baseline testing after the service accumulation is not technically feasible, the applicant may request the Executive Officer to waive the requirement. If there are substantial test data from previous field studies or field demonstrations, applicants may request that the Executive Officer consider these in place of the initial emission tests.

(2) As an alternative to testing a single unit before and after the service accumulation period, the applicant may request that the Executive Officer consider the testing of two identical units, one that has been pre-conditioned and another that has completed the service accumulation period. In reviewing the request, the Executive Officer may consider all relevant information, including, but not limited to, the following:

(A) The effect of the diesel emission control strategy on engine operation over time. Strategies that cause changes in engine operation are likely not to qualify for this testing option.

(B) The quality of the evidence the applicant can provide to support that the two units are identical,

(C) Previous experience with similar or related technologies, and

(D) Whether the applicant is participating in the U.S. EPA verification process and has made an agreement with U.S. EPA to test two units.

(3) For strategies that include exhaust aftertreatment, engine backpressure and exhaust temperature must be measured and recorded on a second-by-second basis (1 Hertz) during at least one baseline run and each of the control test runs.

(4) For strategies that use a chemical reductant to reduce emissions of NOx from on-road or off-road applications, the amount of reductant consumed during each control test run must be measured and recorded.

* * * * *

(j) Functional Testing of Monitoring and Notification Systems. The applicant must demonstrate the durability of all monitoring and notification systems employed by the diesel emission control strategy. Such systems include, but are not limited to, backpressure monitors, reductant level monitors, malfunction indicator systems, and mechanisms to de-rate an engine's maximum power output. The applicant must propose test procedures to demonstrate the durability of the monitoring and notification systems on a

diesel emission control strategy that has completed the service accumulation period.

~~(i)~~ (j) Performance Requirements. The diesel emission control strategy must meet the following requirements throughout the durability demonstration period:

(1) If the applicant claims a percent emission reduction, the percent emission reduction must meet or exceed the initial verified percent emission reduction level.

(2) If the applicant claims to achieve 0.01 g/bhp-hr for PM, the PM emission level must not exceed 0.01 g/bhp-hr.

(3) The diesel emission control system must maintain its physical integrity. Its physical structure and all of its components not specified for regular replacement during the durability demonstration period must remain intact and fully functional.

(4) The diesel emission control strategy must not cause any damage to the engine, vehicle, or equipment.

(5) The backpressure caused by the diesel emission control strategy should not exceed the engine manufacturer's specified limits, or must not result in any damage to the engine.

(6) No maintenance of the diesel emission control system beyond that specified in its owner's manual will be allowed without prior Executive Officer approval.

~~(j)~~ (k) Conditional Verification for Off-road and Stationary Applications. If the Executive Officer determines that the diesel emission control strategy is technologically sound and appropriate for the intended application, he may grant a conditional verification for off-road and stationary applications upon completion of 33 percent of the minimum durability period. In making this determination, the Executive Officer may consider all relevant information including, but not limited to, the following: the design of the diesel emission control system, filter and catalyst substrates used, similarity of the system under consideration to verified systems, the intended application of the diesel emission control system, other relevant testing data, and field experience. Where conditional verification is granted, full verification must be obtained by completing the durability testing and all other remaining requirements. These requirements must be completed within a year after receiving conditional verification ~~if laboratory testing is chosen and within three years if field testing is chosen~~. For the aforementioned time periods, conditional verification is equivalent to verification for the purposes of satisfying the requirements of in-use emission control regulations.

~~(k)~~ (l) Failure During the Durability Demonstration Period. If the diesel emission control strategy fails to maintain its initial verified percent emission reduction or emission level for any reason, the Executive Officer may downgrade the strategy to the verification level which corresponds to the

lowest degraded performance observed in the durability demonstration period. If the diesel emission control strategy fails to maintain at least a 25 percent PM reduction or ~~15~~ 25 percent NOx reduction at any time during the durability period, the diesel emission control strategy will not be verified. If the diesel emission control strategy fails in the course of the durability demonstration period, the applicant must submit a report explaining the circumstances of the failure within 90 days of the failure. The Executive Officer may then determine whether to deny verification or allow the applicant to correct the failed diesel emission control strategy and either continue the durability demonstration or begin a new durability demonstration.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600 and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5 Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

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§ 2705. Field Demonstration Requirements.

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(c) Reporting Requirements.

(1) Temperature and Backpressure Measurement Requirements. For strategies that include exhaust aftertreatment, engine backpressure and exhaust temperature must be measured and recorded over the entire demonstration period. ~~The applicant may propose a sampling scheme for approval by the Executive Officer. The sampling scheme may include, but is not limited to, logging only significant changes in a parameter, averages, or changes above some threshold value.~~ The applicant must propose a measurement and recording protocol for approval by the Executive Officer. The protocol may include, but is not limited to, measurement and recording of values once every few seconds, or higher frequency measurement with recording of averages, minima, and maxima over longer time intervals. Data must be submitted electronically in columns as a text file or another format approved by the Executive Officer.

(2) NOx Emissions Measurement Requirements. For strategies that include exhaust aftertreatment to reduce emissions of NOx, the mass emissions of NOx both upstream and downstream of the aftertreatment device must be measured and recorded over the entire demonstration period. The applicant must propose a measurement method for approval by the Executive Officer. The method may include, but is not limited to, the use of NOx sensors before and after the device. Measurements of NOx emissions must occur on at least a 1 Hertz basis. Data must be recorded

as averages over time intervals no greater than 10 seconds. Data must be submitted electronically in columns as a text file or another format approved by the Executive Officer.

~~(2)~~ (3) Third Party Statement. The applicant must provide a written statement from a third party approved by the Executive Officer, such as the owner or operator of the vehicle or equipment used in the field demonstration. The written statement must be provided at the end of the test period and must describe the following aspects of the field demonstration: overall performance of the test application and the diesel emission control strategy, maintenance performed, problems encountered, and any other relevant information. The results of a visual inspection conducted by the third party at the end of the demonstration period must also be described. The description should comment on whether the diesel emission control strategy is physically intact, securely mounted, leaking any fluids, and should include any other evaluative observations.

(d) Failure During the Field Demonstration. If the diesel emission control strategy fails in the course of the field demonstration, the applicant must submit a report explaining the circumstances of the failure within 90 days of the failure. The Executive Officer may then determine whether to deny verification or allow the applicant to correct the failed diesel emission control strategy and either continue the field demonstration or begin a new demonstration.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600 and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5 Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

§ 2706. Other Requirements.

(a) Limit and Procedure for Measuring Nitrogen Dioxide (NO_2).

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(4) Pre-conditioning requirements. If the Executive Officer determines that a diesel emission control system has a propensity to increase emissions of NO_2 and that NO_2 emissions from a diesel emission control system could be affected by the presence of particulate matter or ash (as with a catalyzed diesel particulate filter), the system must be preconditioned according to the following procedure:

(A) Initial test (prior to service accumulation). Before conducting the initial emissions test, the unit being tested must be pre-conditioned as follows:

1. Install ~~the~~ a new, unused unit on an engine that is an appropriate size for the unit, in a good state of maintenance, and certified to a PM standard equal to or more stringent than that of the engines in the emission control group for which the applicant seeks verification.
2. Operate the engine on one of the test cycles specified below for 25 to 30 hours. For on-road verifications, use either the FTP (hot-start) or UDDS cycle as identified in 2703(e), or the 13-mode Supplemental Emissions Test (SET) in the Code of Federal Regulations, Title 40, Part 86. For off-road and stationary verifications, use either the steady-state test cycle or the Nonroad Composite Transient Cycle (NRTC) from ARB off-road regulations ~~or the Nonroad Transient Cycle (NRTC) in the Code of Federal Regulations, Title 40, Part 1039~~. For up to 10 hours of the 25 to 30 hour period, beginning after at least the first three test cycle repetitions or ending before at least the last three test cycle repetitions, an applicant may alternatively:
   a. Run the engine at high load such that the exhaust temperature is between 350 and 450 degrees Celsius, or
   b. Alternate back and forth between high and low loads such that the exhaust temperature never exceeds 525 degrees Celsius and the low load operation does not result in significant soot accumulation at the end of the pre-conditioning period.
3. Measure and record the backpressure and exhaust temperature on a second-by-second basis (1 Hertz) for the duration of the 25 to 30 hour pre-conditioning period. ~~at least the first three of the repeated test cycles (when the unit is brand new) and the last three (which follow the optional high load operation of up to 10 hours)~~. Determine the average backpressure for at least the first three and last three test cycle repetitions ~~each run~~.
4. Following the 25 to 30 hour period of operation, remove the unit from the pre-conditioning engine and install it on the emissions test engine, if applicable. ~~run three test repetitions (hot-start) of the emissions test cycle with the unit installed on the emissions test engine. If using a chassis dynamometer, run the UDDS. For each run, measure and record the backpressure on a second-by-second basis (1 Hertz) and determine the average.~~ Proceed with the initial emissions test and determine NO_2^i, as defined in section 2706(a)(5). Determine the average backpressure over each of the emissions test repetitions and then average those values. The resulting average backpressure is compared with that of the aged unit per subsection (B), below.

(B) Final test (after the service accumulation). Before conducting the final emissions test, the aged unit may need to be pre-conditioned if the backpressure is too high. The applicant may either first perform the backpressure check described below or directly proceed with the final

emissions test with the understanding that the test must be repeated if the backpressure is too high.

1. Backpressure check. Run ~~three repetitions (hot-start)~~ one hot-start of the emissions test cycle with the aged unit installed on the emissions test engine. If using a chassis dynamometer, run the UDDS. ~~For each run, m~~Measure and record the backpressure on a second-by-second basis (1 Hertz) and determine the average. No pollutant measurements are necessary. Proceed with the emissions test as described in subsection (B)(3.) below if either the average backpressure is within 30 percent of the average backpressure recorded for the initial test unit or, for transient test cycles, the backpressure does not exceed 60 inches of water for more than two percent of the time, or, for steady-state test cycles, the backpressure never exceeds 60 inches of water. Otherwise, pre-condition the aged unit as described in subsection (B)(2.) below.
2. If the backpressure of the aged unit does not comply with the appropriate criterion described in subsection (B)(1.) above ~~is too high~~, burn off excess soot or clean out excess ash as necessary. Run an additional repetition of the emissions test cycle (hot-start) to check if the unit complies with the backpressure criterion. Repeat as necessary.
3. Conduct emissions testing with the aged unit. Determine NO_2^f, as defined in section 2706(a)(5). If the backpressure does not comply with the appropriate criterion described in subsection (B)(1.) above, pre-condition the unit in accordance with subsection (B)(2.) and retest. If the backpressure check in subsection (B)(1.) was conducted prior to emissions testing and the unit was brought into compliance at that time, do not retest.

(C) In-use compliance testing. Before conducting the first phase of in-use compliance emissions testing, the test units may need to be pre-conditioned. Using the required test cycle, measure and record the backpressure on a second-by-second basis (1 Hertz) over one hot-start test with ~~of~~ a cleaned (or pre-conditioned per subsection (A) above) reference unit installed on the engine to be used for in-use compliance testing. The reference unit must be identical to the test units. Measure and record the backpressure of the test units retrieved from the field using the same engine and test cycle (one hot-start) as used with the reference unit. If the backpressure of ~~the~~ a given test units is either within 30 percent of the average backpressure recorded for the reference unit or, for transient test cycles, the backpressure does not exceed 60 inches of water for more than two percent of the time, or, for steady-state test cycles, the backpressure never exceeds 60 inches of water, ~~they do~~ it does not require pre-conditioning. Otherwise, the test units must be pre-conditioned following subsection

(B) above. Other units may not be substituted for the selected test units.

(D)Determination of backpressure. The applicant must submit the actual recorded backpressure in an electronic format as measured on a second-by-second basis over each test run and over the 25 to 30 hour pre-conditioning period. Prior to calculating the average backpressure over a given test run, however, any negative values caused by the draw of the dilution tunnel must first be zeroed.

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(b) Limits on Other Pollutants.

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(3) Limit on Ammonia (NH_3). In order for a diesel emission control strategy to be verified, the diesel emission control strategy must not increase the emissions of ammonia to a level greater than 25 parts per million by volume at the tailpipe on average over any test cycle used to support emission reduction claims.

(c) Fuel Additives. Diesel emission control strategies that use fuel additives must comply with Section 2710 and meet the following additional requirements for verification. Fuel additives must be used in combination with a level 3 diesel particulate filter unless they can be proven to the satisfaction of the Executive Officer to be safe for use alone. In addition, the applicant must meet the following requirements:

(1) The applicant must submit the exact chemical formulation of the fuel additive,

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(d) Alternative Diesel Fuels. Alternative diesel fuels must be in compliance with applicable federal, state, and local government requirements. This requirement includes, but is not limited to registration of the alternative diesel fuel with the U.S. EPA. The applicant must conduct additional emission tests of alternative diesel fuels if the Executive Officer determines that such tests are necessary. The Executive Officer may consider all factors including, but not limited to, fuel components that could adversely affect emissions reductions and/or the applications to which they are applied.

(e) Selective Catalytic Reduction (SCR) Systems. A diesel emission control strategy that uses an SCR system to reduce emissions of NO_x has the following additional requirements:

(1) The diesel emission control strategy must include a system to monitor the amount of reductant available and notify the operator when the level is

low. The notification must occur and be clearly visible to the operator while the vehicle or equipment is in use.

(2) The diesel emission control strategy must include a strong inducement to ensure that the operator maintains a constant supply of reductant to the SCR system. For example, the diesel emission control strategy may include a mechanism to de-rate the engine's maximum power output if the operator fails to refill the reductant tank. The inducement must be both resistant to tampering and strong enough to ensure an uninterrupted supply of reductant. The applicant must propose an inducement for approval by the Executive Officer.

(3) The diesel emission control strategy must include a means to ensure that the reductant present in the tank meets the specifications necessary for the SCR system to function properly. The applicant must propose a quality control strategy for approval by the Executive Officer.

~~(d)~~ (f) Engine Backpressure and Monitoring. During the emission and durability testing, the applicant must demonstrate that the backpressure caused by its diesel emission control system is within the engine manufacturer's specified limits, or will not result in any damage to the engine. Furthermore,

(1) If operation of the engine with the diesel emission control system installed will result in a gradual build-up of backpressure exceeding the engine's specified limits over time (such as due to the accumulation of ash in a filter), information describing how the backpressure will be reduced must be included.

(2) All filter-based diesel emission control systems must be installed with a backpressure monitor to notify the operator when the high backpressure limit, as specified by the engine manufacturer or included in the verification, is approached. The notification must occur and be clearly visible to the operator while the vehicle or equipment is in use. The applicant must identify the high backpressure limits of the system in its application for verification.

(3) The Executive Officer reserves the right to require monitors that identify low backpressure limits in those cases where failures leading to low backpressure are unlikely to be detected, or have the potential to cause environmental damage beyond that caused by the engine prior to being equipped with the emission control strategy (e.g., systems that introduce additives into the fuel).

~~(e)~~ (g) Fuel and Oil Requirements. The applicant must specify the fuel and lubricating oil requirements necessary for proper functioning of the diesel emission control system. The applicant must also specify any consequences that will be caused by failure to comply with these requirements, as well as methods for reversing any negative consequences.

~~(f)~~ (h) Maintenance Requirements. The applicant must identify all normal maintenance requirements for the diesel emission control system. The applicant must specify the recommended intervals for cleaning and/or replacing components. Any components to be replaced within the defects warranty period must be covered with the original diesel emission control system package or provided free of charge to the customer at the appropriate maintenance intervals. Any normal maintenance items that the applicant does not intend to provide free of charge must be approved by the Executive Officer (the applicant is not required to submit cost information for these items). In addition, the applicant must specify procedures for proper handling of spent components and/or materials cleaned from the diesel emission control system. If any such materials are hazardous, the applicant must identify them as such in the owner's manual. For filter-based diesel emission control strategies, the applicant must include procedures for resetting any backpressure monitors after maintenance procedures are completed.

(i) End User Installation Practices. Applicants that authorize end users to remove their verified control systems from the original installed configurations and install them on other vehicles or equipment must first receive approval of such practices from the Executive Officer. Applicants that allow such practices are responsible for the warranty and in-use compliance requirements (see sections 2702 and 2709) of those systems. Applicants must specify acceptable end user installation practices in the owner's manual and the installation manual (see section 2706(l) and 2706(n)) and possible consequences if end users do not follow authorized practices. Applicants may include descriptions of circumstances that may result in a denial of warranty coverage, but these descriptions shall not limit warranty coverage in any way.

~~(g)~~ (j) System Labeling.

(1) The applicant must ensure that ~~a legible and durable label is~~ identical, legible, and durable labels are affixed on both the diesel emission control system and the engine (or an alternate location approved by the Executive Officer) on which the diesel emission control system is installed except as noted in (3) below. The required labels must identify the name, address, and phone number of the manufacturer, the diesel emission control strategy family name (defined in (2) below) of the installed system, a unique serial number, and the month and year of manufacture. The month and year of manufacture are not required on the label if this information can be readily obtained from the applicant by reference to the serial number. The applicant and installer must ensure that the label is affixed such that it is resistant to tampering and degradation from the conditions of its environment. The applicant and/or installer must ensure that the label is visible after installation. A scale drawing of a sample label must be submitted with the verification

application. Unless an alternative is approved by the Executive Officer, the label information must be in the following format:

Name, Address, and Phone Number of Manufacturer
Diesel Emission Control Strategy Family Name
Product Serial Number
ZZ-ZZ (Month and Year of manufacture, e.g., 06-02)

(2) Diesel Emission Control Strategy Family Name. Each diesel emission control strategy shall be assigned a family name defined as below:

CA/MMM/YYYY/PM#/N##/APP/XXXXX

CA: Designates a diesel emission control strategy verified in California
MMM: Manufacturer code (assigned by the Executive Officer)
YYYY: Year of verification
PM#: PM verification level 0, 1, 1+, 2, 2+, 3, or 3+ (e.g., PM3 means a level 3 PM emission control system).
N##: NOx verified reduction level in percent, if any (e.g., N25 means NOx reduction of 25 percent).
APP: Verified application which may include a combination of On-road (ON),Off-road (OF),or Stationary (ST)
XXXXX: Five alphanumeric character code issued by the Executive Officer

(3) The applicant may request that the Executive Officer approve an alternative label format ~~or waive the requirement to affix a label to the diesel emission control system or engine as described in this section~~. In reviewing this request, the Executive Officer may consider all relevant information including, but not limited to, the informational content of an alternative label as proposed by the applicant.

~~(h)~~ (k) Additional Information. The Executive Officer may require the applicant to provide additional information about the diesel emission control strategy or its implementation when such information is needed to assess environmental impacts associated with its use.

~~(i)~~ (l) Owner's Manual. The applicant must provide a copy of the diesel emission control system owner's manual, which must clearly specify at least the following information:

(1) Warranty statement including the warranty period over which the applicant is liable for any defects.
(2) Installation procedure and maintenance requirements for the diesel emission control system.
(3) Possible backpressure range imposed on the engine.
(4) Fuel consumption penalty, if any.
(5) Fuel requirements including sulfur limit, if any.
(6) Handling and supply of additives, if any.
(7) Instructions for reading and resetting the backpressure monitor.
(8) Requirements for lubrication oil quality and maximum lubrication oil consumption rate.
(9) Contact information for replacement components and cleaning agents.
(10) Contact information to assist an end-user to determine proper ways to dispose of waste generated by the diesel emission control strategy (e.g., ash accumulated in filter-based systems). At a minimum, the owner's manual should indicate that disposal must be in accordance with all applicable Federal, State and local laws governing waste disposal.
(11) Appropriate methods of removing the diesel emission control system from the original installed configuration and installing the system on a different vehicle or piece of equipment, if such practices are allowed. The applicant must state possible repercussions to the end user if such practices are done in an inappropriate manner. (See section 2706(i))
(12) Parts List.

~~(j)~~ (m) Noise Level Control. Any diesel emission control system that replaces a muffler must continue to provide at a minimum the same level of exhaust noise attenuation as the muffler with which the vehicle was originally equipped by the vehicle or engine manufacturer. Applicants must ensure that the diesel emission control system complies with all applicable noise limits contained in Part 205, Title 40, Code of Federal Regulations and California Vehicle Code, Sections 27150, 27151 and 27200 through 27207, for the gross vehicle weight rating and year of manufacture of the vehicle for which the diesel emission control strategy is intended. All diesel emission control systems must be in compliance with applicable local government requirements for noise control.

(n) Installation Manual. The applicant must provide a copy of the diesel emission control system installation manual that the applicant intends to provide to installers and/or owners.

(o) Parts List. The applicant must include a list of all of the component parts of the diesel emission control system. All primary components must be listed, including, but not limited to, substrates, electronic control units, sensors, injectors, pumps, blowers, storage tanks, and notification lights. Brackets, fasteners, and wiring need not be included. For each listed component, the

applicant must give a description and identification number. The applicant must also clearly specify which parts, if any, are not covered by the warranty. Parts that may be excluded from warranty coverage are subject to approval by the Executive Officer.

~~(k)~~ (p) Multimedia Assessment for Fuel Strategies. Diesel emission control strategies which rely on fuel changes either through use of additives or through use of alternative diesel fuels must undergo an evaluation of the multimedia effects. No diesel emission control strategy that relies on the use of an additive or an alternative fuel may be verified unless a multimedia evaluation of the additive or alternative fuel has been conducted and the California Environmental Policy Council established by Public Resources Code section 71017 has determined that such use will not cause a significant adverse impact on the public health or the environment, pursuant to Health and Safety Code section 43830.8. No person shall sell, offer for sale, supply or offer for supply an alternative fuel or a diesel fuel in California that contains an additive for use in a verified diesel emission control strategy unless such a multimedia evaluation has been conducted and resulted in a determination that use of the alternative fuel or additive will not cause a significant adverse impact on the public health and the environment. The applicant shall bear the expense of conducting the multimedia assessment.

(q) Sales and Installation. No person or entity shall advertise, sell, lease, supply, offer for sale, represent, or install any device, apparatus, mechanism, or fuel based system as a verified diesel emission control strategy for or on any engine, vehicle or equipment that does not meet the terms and conditions of the strategy's Executive Order. The applicant, distributor, and/or installer must ensure that each verified diesel emission control strategy is supplied, sold, leased, and installed pursuant to the provisions of the Executive Order. Failure to follow the provisions of the Executive Order may result in revocation or suspension of the verification and/or any other remedy available under Part 5, Division 26 of the Health and Safety Code.

(r) Aftertreatment Devices. Any control strategy that is verified after January 24, 2008 that includes an aftertreatment device such as a diesel particulate filter, must be designed such that the aftertreatment device can only be installed on the application in one unique direction. The aftertreatment device must indicate the proper direction of exhaust flow so the end user or installer can clearly see how to properly install the device.

~~(l)~~ (s) Verification of a diesel emission control strategy by the Air Resources Board does not release the applicant from complying with all other applicable legal requirements.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600, 43700 and 43830.8, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, 43204-43205.5 and 43830.8, Health and Safety Code; Section 71017, Public Resources Code; and Title 17 of Regulations Section 93000.

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§ 2708. Determination of Emissions Reduction.

(a) Calculation of Emissions Reduction. The emissions reduction verified for a diesel emission control strategy is based on the average of all valid test results before (baseline) and after (control) implementation of the diesel emission control strategy. Test results from both emission testing and durability testing are to be used. If the applicant chooses to perform either the initial or the final durability baseline test, but not both, it must use those results to calculate the reductions obtained in both the initial and final control tests.

(1) Percentage Reduction. The percentage reduction for a given pair of baseline and control test sets (where a "set" consists of all test cycle repetitions, e.g., the test set of 3 hot-start UDDS tests) is the difference between the average baseline and average control emissions divided by the average baseline emissions, multiplied by 100 percent. The average of all such reductions, as shown in the equation below, is used in the verification of a diesel emission control strategy.

$$\text{Percentage Reduction} = 100\% \times \frac{\Sigma\,[(\text{baseline}_{AVG} - \text{control}_{AVG})/\text{baseline}_{AVG}]}{\text{Number of control test sets}}$$

Where:

Σ = sum over all control test sets

baseline_{AVG} or control_{AVG} = average of emissions from all baseline or control test repetitions within a given set

(A) For any test set involving cold and hot starts, the time weighted emission result is to be calculated by weighting the cold-start emissions by one-seventh (1/7) and the hot-start emissions by six-sevenths (6/7) as shown below.

Weighted Emission Result = 1/7* average cold-start emissions + 6/7* average hot-start emissions

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(b) Categorization of the Diesel Emission Control Strategy. The Executive Officer shall categorize diesel emission control strategies to reduce PM and NOx emissions based on their verified emission reductions. Diesel emission control strategies that reduce NOx will be assigned their verified emission reduction (Mark 1, 2, 3, 4, or 5) in ~~five~~ 15 percent increments starting at 25 percent (See Table 1). Diesel emission control strategies are categorized by their PM reductions as follows:

(1) Level zero: the system has been demonstrated under these procedures to reduce PM emissions by less than 25 percent from the baseline emission level and to reduce NOx emissions by at least 25 percent.

(~~1~~2) Level one: the system has been demonstrated under these procedures to reduce PM emissions by at least 25 percent from the baseline emission level.

(~~2~~3) Level two: the system has been demonstrated under these procedures to reduce PM emissions by at least 50 percent from the baseline emission level.

(~~3~~4) Level three: the system has been demonstrated under these procedures to reduce PM emissions by at least 85 percent from the baseline emission level, or to achieve PM emission levels of 0.01 grams per brake-horsepower-hour (g/bhp-hr) or less.

Diesel emission control strategies are categorized by their NOx reductions as follows:

(1) Mark 1: the system has been demonstrated under these procedures to reduce NOx emissions by at least 25 percent from the baseline emission level.

(2) Mark 2: the system has been demonstrated under these procedures to reduce NOx emissions by at least 40 percent from the baseline emission level.

(3) Mark 3: the system has been demonstrated under these procedures to reduce NOx emissions by at least 55 percent from the baseline emission level.

(4) Mark 4: the system has been demonstrated under these procedures to reduce NOx emissions by at least 70 percent from the baseline emission level.

(5) Mark 5: the system has been demonstrated under these procedures to reduce NOx emissions by at least 85 percent from the baseline emission level.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600 and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

§ 2709. In-Use Compliance Requirements.

(a) Applicability. These in-use compliance requirements apply to all diesel emission control strategies for on-road, off-road, and stationary applications. It is the responsibility of the applicant to perform in-use compliance testing for each verified diesel emission control strategy family (see Section 2706~~(g)~~ (j) (2)). Testing is required when 50 units within a given diesel emission control strategy family have been sold or leased in the California market. Applicants must submit an in-use compliance testing proposal for approval by the Executive Officer prior to the in-use compliance testing. Applicants who have sold 50 units or more but have less than 50 units installed may submit a request for the Executive Officer to delay the in-use compliance deadlines specified in this section.

(b) Test Phases. In-use compliance testing, as described below in ~~(c), (d), and (e)~~ subsections (d), (e), (f), and (g), must be conducted per an approved in-use compliance testing proposal at two different phases for each diesel emission control strategy family:

(1) Phase 1. Applicants must obtain and test diesel emission control systems once they have been operated for at least ~~one year or within three months of their first maintenance~~ 25 percent of their minimum warranty period or for one year, whichever comes first.

(2) Phase 2. Applicants must obtain and test diesel emission control systems once they have been operated between 60 and 80 percent of their minimum warranty period. For all systems used with heavy heavy-duty vehicles, the 60 to 80 percent window must be applied to the 5 year or 150,000 mile minimum warranty period.

(c) In-Use Compliance Testing Proposal. The applicant must submit to the Executive Officer a Phase 1 in-use compliance testing proposal no later than 90 days after selling the 50th unit. The applicant must submit a Phase 2 in-use compliance testing proposal to the Executive Officer no later than 3 years after the 50th unit is sold. The following information must be included in both testing proposals:

(1) Applicant identification.
(2) Diesel emission control strategy family name.
(3) Parties to be involved in conducting in-use compliance tests.
(4) Test facility identification and description.
(5) Quality control and quality assurance procedures for the test equipment.
(6) List of candidate test units (at least 10 choices per phase) with the following information for each: vehicle/equipment information on which the unit is installed (make, model, model year), location, engine information

(family name, make, series, model year, displacement), date of manufacture, date of installation, and cleaning/repair history.

(7) Cumulative sales of the emission control strategy family in each application.

(8) Predicted mileage or hours of use each diesel emission control system will have accrued by the time it is obtained.

(9) Description of test vehicles and engines (engine family name, make, model, model year, displacement)

(10) Testing plan for meeting the requirements of part (g) below.

Within 45 days of receipt of the completed testing proposal, the Executive Officer shall determine whether the applicant has an appropriate testing proposal to support in-use compliance testing. The in-use testing proposal will not be considered approved until the Executive Officer issues the applicant a letter of approval. If the Executive Officer determines that the testing proposal is insufficient or inappropriate, the applicant must, within 30 days, submit a revised testing proposal.

~~(c)~~ (d) Selection of Diesel Emission Control Systems for Testing. For each diesel emission control strategy family and for both test phases, ~~the Executive Officer will identify a representative sample of engines or vehicles equipped with diesel emission control systems for in-use compliance testing.~~ the applicant must propose a representative sample of installed diesel emission control systems for in-use compliance testing based on information provided per Section 2709(c) to be approved by the Executive Officer. The selected diesel emission control systems should come from a representative sample of engines or vehicles equipped with the control systems. The engines or vehicles equipped with the selected diesel emission control systems must have good maintenance records and may receive a tune-up or normal maintenance prior to ~~testing~~ the applicant obtaining the diesel emission control systems for testing. The applicant must obtain information from the end users regarding the diesel emission control systems' accumulated mileage or hours of usage, maintenance records (to the extent practicable), operating conditions and a description of any unscheduled maintenance that may affect the emission results.

(e) Selection of Test Engines. The Executive Officer must approve the appropriate test engines or vehicles for in-use compliance testing. The applicant must provide candidate test vehicles/engines for the Executive Officer's review. If the Executive Officer determines that a diesel emission control system affects the performance of the engine, the Executive Officer may require the applicant to test the selected diesel emission control system with the engine on which it is installed. The applicant may tune-up or rebuild test engines prior to, but not after, baseline testing unless rebuilding the engine is an integral part of the diesel emission control strategy. All testing

should be performed with the test engine in a proper state of maintenance. Emissions of NO_2 from the test engine must not exceed 15 percent of the total baseline NOx emissions by mass. If there is a special category of engines with NO_2 emission levels that normally exceed 15 percent, this requirement may be adjusted for those engines at the discretion of the Executive Officer.

~~(d)~~ (f) Number of Diesel Emission Control Systems to be Tested. The number of diesel emission control systems an applicant must test in each of the two test phases will be determined as follows:

(1) A minimum of four diesel emission control systems in each diesel emission control strategy family must be tested. For every system tested that does not reduce emissions by at least 90 percent of the lower bound of its initial verification level (or does not achieve an emission level less than or equal to 0.011 g/bhp-hr of PM) or does not meet the NO_2 requirement in section 2709~~(j)~~ (k), two more diesel emission control systems from the same family must be obtained and tested. The total number of systems tested shall not exceed ten per diesel emission control strategy family.

(2) At the discretion of the Executive Officer, applicants may begin by testing more than the minimum of four diesel emission control systems. Applicants may concede failure of an emission control system before testing a total of ten diesel emission control systems.

~~(e)~~ (g) In-use Compliance Emission Testing. Applicants must follow the testing procedure used for emission reduction verification as described in Section 2703 (both baseline and control tests are required). ~~,and special pre-conditioning requirements may apply (see section 2706(a)(4) for details). In addition, applicants must select the same test cycle(s) that they used to verify the diesel emission control strategy originally.~~ As provided in Section 2709(h), the applicant may request the Executive Officer to review and approve an alternative testing procedure. If a diesel emission control strategy verified by U.S. EPA must perform engine dynamometer testing with the Heavy-duty Transient FTP cycle to fulfill the in-use compliance requirements of that program, but was verified by the Executive Officer with chassis dynamometer testing, the Executive Officer will also accept testing with the Heavy-duty Transient FTP cycle for the in-use compliance requirements of this Procedure. ~~If a diesel emission control strategy fails catastrophically during the in-use compliance testing, the applicant must provide an investigative report detailing the causes of the failure to the Executive Officer within 90 days of the failure~~.

~~(f) The Executive Officer may approve an alternative to the in-use testing described above, on a case-by-case basis, if such testing is overly burdensome to either the applicant or to the end-users due to the nature of~~

~~the industry the particular diesel emission control systems are used in. The proposed alternative must use scientifically sound methodology and be designed to determine whether the diesel emission control strategy is in compliance with the emission reductions the Executive Officer verified it to.~~

(h) Alternative Test Cycles and Methods. The Executive Officer may consider, on a case by case basis, an alternative test plan or method for applicants to satisfy the in-use compliance requirements of this section. The proposed alternative test plan must be as scientifically sound as the testing described in Section 2709(g) of the Procedure and it must produce accurate results that will indicate if the emission control system reduces emissions to the level for which it was verified. Use of an alternative test procedure must be approved by the Executive Officer.

~~(g) The Executive Officer may, with respect to any diesel emission control strategy sold, leased, offered for sale, or manufactured for sale in California, order the applicant or strategy manufacturer to make available for compliance testing and/or inspection a reasonable number of diesel emission control systems, and may direct that they be delivered at the applicant's expense to the state board at the Haagen-Smit Laboratory, 9528 Telstar Avenue, El Monte, California or where specified by the Executive Officer. The Executive Officer may also, with respect to any diesel emission control strategy being sold, leased, offered for sale, or manufactured for sale in California, have an applicant compliance test and/or inspect a reasonable number of units at the applicant or manufacturer's facility or at any mutually agreeable test laboratory under the supervision of the ARB Executive Officer.~~

~~(h)~~ (i) In-Use Compliance Report. The applicant must submit an in-use compliance report to the Executive Officer ~~within three months of completing each phase of testing~~ after each phase of testing. The applicant must submit the phase 1 report within 18 months from when the 50th unit is sold. The phase 2 report must be submitted within 4 years from when the 50th unit is sold. The following information must be reported for each of the minimum of four diesel emission control systems tested:

(1) Parties involved in conducting the in-use compliance tests.
(2) Quality control and quality assurance information for the test equipment.
(3) Diesel emission control strategy family name and manufacture date.
(4) Vehicle or equipment and type of engine (engine family name, make, model year, model, displacement, etc.) the diesel emission control system was applied to.
(5) ~~Estimated~~ Mileage or hours the diesel emission control system was in use.
(6) Results of all emission testing.
(7) Summary of all maintenance, adjustments, modifications, and repairs performed on the diesel emission control system.

~~(i)~~ (j) The Executive Officer may request the applicant to perform additional in-use testing if the warranty claims exceed four percent of the number of diesel engines using the diesel emission control strategy, or based on other relevant information. As noted in Section 2707(c), if warranty claims exceed four percent of the number of diesel engines using the diesel emission control strategy, the applicant must notify the Executive Officer and submit a warranty report within 30 calendar days of that time.

~~(j)~~ (k) Conditions for Passing In-Use Compliance Testing. For a diesel emission control strategy to pass in-use compliance testing, emission test results must indicate that the strategy reduced emissions by at least 90 percent of the lower bound of the emission reduction level the Executive Officer originally verified it to. In addition, the strategy must meet the requirements of section 2706(a) with the exception that the strategy must not increase emissions of NO_2 by more than an increment equivalent in mass to 33 or 22 percent of the baseline NOx emission level for systems verified under the 30 or 20 percent NO_2 limits, respectively. If the first four diesel emission control systems tested within a diesel emission control strategy family meet both of these standards, the diesel emission control strategy passes in-use compliance testing. If any of the first four diesel emission control systems tested within a diesel emission control strategy family fail to meet either of these standards, and more than four units are tested, at least 70 percent of all units tested must meet both standards for the diesel emission control strategy family to pass in-use compliance testing. For each failed test, for which the cause of failure can be attributed to the product and not to maintenance or other engine-related problems, two additional units must be tested, up to a total of ten units per diesel emission control strategy family. Within 30 days of a test unit failing, the applicant must submit to the Executive Officer for approval a testing proposal for the additional test units that is compliant with part (c) above. The testing proposal must include an investigative report detailing the causes of the failure. The Executive Officer shall, within 45 days of its receipt, determine whether the test plan is acceptable. After receiving approval from the Executive Officer, the applicant must complete testing.

~~(k)~~ (l) Failure of In-use Compliance Testing. If a diesel emission control strategy family does not meet the minimum in-use compliance requirements ~~for compliance~~ of this section, the applicant must submit a remedial report within 90 days after the in-use compliance report is submitted. The remedial report must include:

(1) Summary of the in-use compliance report.

(2) Detailed analysis of the failed diesel emission control systems and possible reasons for failure.

(3) Remedial measures to correct or replace failed diesel emission control systems as well as the rest of the in-use diesel emission control systems.

~~(l)~~ (m) The Executive Officer ~~may~~ shall evaluate the remedial report, annual warranty report, and all other relevant information to determine if the diesel emission control strategy family ~~passes in-use compliance testing~~ satisfies the in-use compliance requirements. The Executive Officer may request ~~more~~ additional information from the applicant. Based on this review, the Executive Officer may lower the verification level or revoke the verification status of a verified diesel emission control strategy family. The Executive Officer may also lower the verification level or revoke the verification status of a verified diesel emission control strategy family, if the applicant does not conduct in-use compliance testing in accordance with this section, or if the Executive Officer conducts in-use compliance testing in accordance with this section (including alternative testing) and the diesel emission control strategy family does not pass the standards in this section.

~~(m)~~ (n) The Executive Officer may lower the verification level or revoke the verification status of a verified diesel emission control strategy family if the applicant fails to observe the requirements of Sections 2706 or 2707. The Executive Officer must allow the applicant an opportunity to address the possible lowering or revocation of the verification level in a remedial report to the Executive Officer and the Executive Officer may make this determination based on all relevant information.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600 and 43700, Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code; and Title 17 California Code of Regulations Section 93000.

§ 2710. Verification of Emission Reductions for Alternative Diesel Fuels and Fuel Additives

(a) Applicability. This section applies to in-use strategies that include emission reductions from the use of alternative diesel fuels or fuel additives. The requirements in this section are in addition to those in Sections 2700-2709, except as specifically noted.

(b) Alternative Diesel Fuel and Fuel Additive Proposed Test Protocol. The applicant must submit a proposed test protocol which includes:
(1) References to criteria pollutant and toxic emissions sampling and analyses that are consistent with the requirements of Section 2703.
(2) Description and Parameters of Alternative Diesel Fuels and Fuel Additives.

(A) The applicant must describe the applicability of the alternative diesel fuel or fuel additive to diesel engines and identify any requirements for engine or fuel system modifications.

(B) The applicant must provide a general description of the alternative diesel fuel or fuel additive that includes the fuel type, fuel characteristics, fuel properties, fuel formulation, and chemical composition. The applicant for the candidate alternative diesel fuel or fuel additive must specify the following:

1. Identity, chemical composition, and concentration of fuel additives
2. Sulfur content
3. Total aromatic content
4. Total polycyclic aromatic hydrocarbon content
5. Nitrogen content
6. API gravity (density)
7. Distillation temperature distribution information, initial boiling point (IBP),
8. 10% recovered (REC), 5O% REC, 90% REC, and end point (EP)

(C) The applicant must provide information on the candidate alternative diesel fuel or fuel additive that may affect engine performance, engine wear, and safety. The applicant for the candidate alternative diesel fuel or fuel additive must specify the following:

1. Viscosity (engine performance)
2. Fuel volatility (engine performance)
3. Ignition quality (engine performance)
4. Fuel operating temperatures (engine performance)
5. Engine wear tendencies (engine wear)
6. Corrosion (engine wear)
7. Lubricity (engine wear)
8. Fuel flash point (safety)

(D)The applicant must provide information on the candidate alternative diesel fuel or fuel additive to determine if there are chemicals in the fuel that may increase levels of toxic compounds or potentially form toxic compounds in the fuel. The applicant will conduct an analysis for metals and elements by a method specified by the applicant. Copper, iron, cerium, lead, cadmium, chromium, and phosphorus must be included in the analysis. Additional analysis for other toxic compounds may be required after reviewing the chemical composition of the candidate alternative diesel fuel and its additives or fuel additive . (Note: For alternative diesel fuels or fuel additives that are in part comprised of standard diesel fuel, such as emulsified diesel fuels, a toxic analysis of the diesel base fuel is not necessary).

(E) With the approval of the Executive Officer or designee, an applicant may also specify different fuel parameters and test methods that are appropriate to better characterize the candidate alternative diesel fuel or fuel additive .

(3) Upon review of the proposed test protocol, the Executive Officer or designee may require additional fuel components, parameters, and specifications to be determined.

(4) Reference Fuel Specifications. The reference fuel used in the comparative testing described in Section 2710(d) allows the applicant three options in selecting a reference fuel.

~~(4)~~(A) Option (1). The first option is to use a 10 percent aromatic California diesel reference fuel. The reference fuel must be produced from straight-run California diesel fuel by a hydrodearomatization process and must have the characteristics set forth below under "Reference Fuel Specifications" (the listed ASTM methods are incorporated herein by reference).

(B) Option (2). The second option is to make the reference fuel from a custom blend using a "like" California diesel fuel made from a straight-run California diesel fuel by a hydroaromatization process and must have the characteristics set forth below under "Reference fuel Specifications". In addition the reference fuel must exhibit the bell shaped distillation curve characteristic of diesel fuel and no chemical feedstocks or pure chemicals such as solvents can be used as blend stocks. Details of the source and specifications of the feedstocks must be provided in the protocol and the processes and diesel feedstocks used to make the reference fuel must be reviewed and approved by the Executive Officer.

(C) Option (3). For alternative diesel fuels and fuel additives that contain diesel as a base fuel such as emulsified diesel fuel and 80:20 biodiesel fuel (80 percent diesel/20 percent biodiesel), the base diesel fuel used to make the alternative diesel fuel or fuel additive can be used in place of the 10 percent aromatic California diesel reference fuel. The base diesel fuel must be a certified, commercially available diesel fuel sold in California. The sulfur content, aromatic hydrocarbon content, polycyclic aromatic hydrocarbon content, nitrogen content, natural cetane number, API gravity, viscosity, and distillation specifications must be provided for the base diesel fuel used for the reference fuel.

Table 6. Fuel Test Methods and Reference Fuel Specifications

Property	General Reference Fuel Specifications	ASTM Test Method
Sulfur Content	~~500~~ 15 ppm max	D5453-93
Aromatic Hydrocarbon content, Vol. %	10% max	D5186-96
Polycyclic Aromatic Hydrocarbon content %	1.4% max	D5186-96

Nitrogen Content	10 ppm max	D4629-96
Natural Cetane Number	48 min	D613-84
Gravity, API	33-39	D287-82
Viscosity at 40°, cSt	2.0-4.1	D445-83
Flash point, °F	130	D93-80
Distillation, °F		D86-96
IBP	340-420	
10%REC	400-490	
50%REC	470-560	
90%REC	550-610	
EP	580-660	

(5) The identity of the entity proposed to conduct the tests described in Section 2710(d);
(6) Reasonably adequate quality assurance and quality control procedures;
(7) Notification of any outlier identification and exclusion procedure that will be used, and
(8) A demonstration that any procedure meets generally accepted statistical principles.

(c) Application for Alternative Diesel Fuel and Fuel Additive Emission Reduction Verification. Upon completion of the tests, the applicant may submit an application for verification to the Executive Officer or designee. The application must follow the format in Section 2702(d) as applicable and include:
(1) The approved test protocol,
(2) All of the test data,
(3) Copy of the complete test log prepared in accordance with Section 2710(d)(3)(B),
(4) A demonstration that the candidate alternative diesel fuel or fuel additive meets the requirements for verification set forth in this section, and
(5) Such other information as the Executive Officer or designee may reasonably require.

(d) Emissions Test Procedures for Particulates, Nitrogen Oxides, Soluble Organic Fraction, Hydrocarbons, and Toxics.
(1) Criteria pollutants test requirements. In each test of a fuel, exhaust emissions of NO_x, NO_2 (pursuant to Section 2706(a)(2)), total PM, carbon monoxide, carbon dioxide, and hydrocarbons must be measured. In addition, for each test the soluble organic fraction (SOF) of the particulate matter in the exhaust emissions must be determined in accordance with the Air Resources Board's "Test Method for Soluble Organic Fraction (SOF) Extraction" dated April 1989, which is incorporated herein by reference.
(2) Toxic emissions sampling and analysis requirements. Exhaust emissions of formaldehyde, acetaldehyde, benzene, toluene, ethyl benzene, xylenes,

butadiene, and polycyclic aromatic hydrocarbons are to be sampled and analyzed as specified in Table 7 for a minimum of three test samples collected from separate emission test repetitions.

Table 7. Toxics sampling and analysis [1,2]

Toxics	Method
Formaldehyde and acetaldehyde	ARB SOP 104
Benzene toluene, ethyl benzene, xylenes, and butadiene	ARB SOP 102/103
Polycyclic aromatic hydrocarbons	ARB method 429[3]

[1]Additional toxics sampling may be required depending on the chemical composition of the additives in the fuel.
[2]At a minimum tunnel blanks are required prior to and after conducting toxic emissions sampling for the reference fuel and candidate alternative diesel fuel or fuel additive .
[3]PAH sampling consists of a filter to collect particulate PAHs and XAD resin to collect volatile PAHs. The sampling protocol needs to be included in the test protocol. Analysis of the samples will be performed by ARB method 429.

(3) Emission test requirements and test sequence for emissions test program.

(A) The applicant must follow the emission test requirements from Section 2703 subsections (a), (b), (k), (l), and (m)~~, and (n)~~. For all on-road~~, off-road, and stationary~~ diesel vehicles and equipment, the applicant must conduct engine dynamometer testing using the Federal Test Procedure (FTP) Heavy-duty Transient Cycle, in accordance with the provisions in the Code of Federal Regulations, Title 40, Part 86, Subpart N. For all off-road and stationary diesel vehicles and equipment, the applicant must conduct engine dynamometer testing in accordance with Section 2703(e)(2) and 2703(e)(3). The applicant must use one of the following test sequences:

1. If both cold start and hot start exhaust emission tests are conducted, a minimum of five exhaust emission tests must be performed on the engine with each fuel, using either of the following sequences, where "R" is the reference fuel and "C" is the candidate alternative diesel fuel or fuel additive : RC CR RC CR RC (and continuing in the same order) or RC RC RC RC RC (and continuing in the same order). The engine mapping procedures and a conditioning transient cycle must be conducted with the reference fuel before each cold start procedure using the reference fuel. The reference cycle used for the candidate alternative diesel fuel or fuel additive must be the same as determined for the reference fuel.

2. If only hot start exhaust emission tests are conducted, one of the following test sequences must be used throughout the testing, where "R" is the reference fuel and "C" is the candidate alternative diesel fuel or fuel additive :

   Alternative 1: RC CR RC CR (continuing in the same order for a given calendar day; a minimum of twenty individual exhaust emission tests must be completed with each fuel)

   Alternative 2: RR CC RR CC (continuing in the same order for a given calendar day; a minimum of twenty individual exhaust emission tests must be completed with each fuel)

   Alternative 3: RRR CCC RRR CCC (continuing in the same order for a given calendar day: a minimum of twenty-one individual exhaust emission tests must be completed with each fuel)

   For all alternatives, an equal number of tests must be conducted using the reference fuel and the candidate alternative diesel fuel or fuel additive on any given calendar day. At the beginning of each calendar day, the sequence of testing must begin with the fuel that was tested at the end of the preceding day. The engine mapping procedures and a conditioning transient cycle must be conducted at the beginning of each day for the reference fuel. The reference cycle used for the candidate alternative diesel fuel or fuel additive must be the same as determined for the reference fuel.

3. Alternative test sequence. The applicant may request the Executive Officer to approve an alternative test sequence in place of the above test sequences. In reviewing this request, the Executive Officer may consider all relevant information including, but not limited to, the following:
   ~~(i.)~~ a. Statistical and scientific equivalence to 1. or 2., and
   ~~(ii.)~~ b. Body of existing test data using the alternative test sequence.

(B) The applicant must submit a test schedule to the Executive Officer or designee at least one week prior to commencement of the tests. The test schedule must identify the days on which the tests will be conducted, and must provide for conducting test consecutively without substantial interruptions other than those resulting from the normal hours of operations at the test facility. The Executive Officer or designee should be permitted to observe any tests. The party conducting the tests must maintain a test log which identifies all tests conducted, all engine mapping procedures, all physical modifications to or operational tests of the engine, all recalibrations or other changes to the test instruments, and all interruptions between tests, and the reason for each interruption. The party conducting the tests or the

applicant must notify the Executive Officer or designee by telephone and in writing of any unscheduled interruption resulting in a test delay of 48 hours or more, and the reason for such delay. Prior to restarting the test, the applicant or person conducting the tests must provide the Executive Officer or designee with a revised schedule for the remaining tests. All tests conducted in accordance with the test schedule, other than any test rejected in accordance with an outlier identification and exclusion procedure included in the approved test protocol, must be included in the comparison of emissions..

(C) Upon approval of the Executive Officer or designee, the applicant may specify an alternative test sequence to Section 2710(d)(3)(A). The applicant must provide the rationale demonstrating that the alternative test sequence better characterizes the average emissions difference between the reference fuel and the alternative diesel fuel or fuel additive .

(e) Durability.

(1) The applicant must meet the durability demonstration requirements in Section 2704 subsections (a), (b), (d), (e), and (h) with the exceptions of emission testing and fuel requirements. If the applicant's diesel emission control strategy includes hardware components in addition to the alternative diesel fuel or fuel additive, then the emission testing requirements in Section 2704 apply.

(2) The applicant must provide test data obtained after completion of the service accumulation, described in Section 2704(d), showing that the candidate alternative diesel fuel or fuel additive does not adversely affect the performance and operation of diesel engines or cause premature wear or cause damage to diesel engines. This must include but is not limited to lubricity, corrosion, and damage to engine parts such as fuel injector tips. The applicant must provide data showing under what temperature and conditions the candidate alternative diesel fuel or fuel additive remains stable and usable in California.

(f) Multimedia Assessment for Fuel Strategies. Diesel emission control strategies which rely on fuel changes either through use of additives or through use of alternative diesel fuels must undergo an evaluation of the multimedia effects. No diesel emission control strategy that relies on the use of an additive or an alternative fuel may be verified unless a multimedia evaluation of the additive or alternative fuel has been conducted and the California Environmental Policy Council established by Public Resources Code section 71017 has determined that such use will not cause a significant adverse impact on the public health or the environment, pursuant to Health and Safety Code section 43830.8. No person shall sell, offer for sale, supply or offer for supply an alternative fuel or a diesel fuel in California that contains an additive for use in a verified diesel emission control strategy unless such a multimedia evaluation has been conducted and resulted in a determination that use of the

alternative fuel or additive will not cause a significant adverse impact on the public health and the environment. The applicant shall bear the expense of conducting the multimedia assessment.

(g) Other Requirements.
(1) The candidate alternative diesel fuel or fuel additive must be in compliance with applicable federal, state, and local government requirements.
(2) Applicants planning to market fuel in California must contact and register with the U.S. EPA and the California Dept. of Food and Agriculture. Contacts are listed below.

Office of Transportation and Air Quality
U.S. EPA Head Quarters
Ariel Rios Blvd.
1200 Pennsylvania Ave, N.W.
Washington DC 20468
Phone (202) 564-9303

Petroleum Products/Weighmaster Enforcement Branch
Division of Measurement Standards
Dept. of Food and Agriculture
8500 Fruitridge Road, Sacramento CA 95826
Phone (916) 229-3000

(3) Additional government agencies such as the California Energy Commission, Area Council of Governments, and Local Air Quality Management Districts may be contacted to facilitate the marketing of alternative diesel fuel in California.

(h) Conditional Verification.
(1) The Executive Officer may grant a conditional verification for an alternative diesel fuel or fuel additive for off-road or stationary applications only after the conditional verification for on-road application is granted. The Executive Officer may grant a conditional verification for on-road application if the applicant meets the following conditions:
(A) The applicant has applied for U.S. EPA registration of the alternative diesel fuel or fuel additive ;
(B) The U.S. EPA has granted a research and development exemption or otherwise granted permission for the alternative diesel fuel or fuel additive to be used, and;
(C) All relevant requirements of Sections 2700-2710 have been met with the exception that registration with the U.S. EPA has not been completed.
(D) Multimedia Assessment as specified in Section 2710 (f).

(2) Where conditional verification is granted, full verification must be obtained by completing the U.S. EPA registration process within a year after receiving conditional verification. During that year, conditional verification is equivalent to verification for the purposes of satisfying the requirements of in-use emission control regulations.

(i) Extensions of an Existing Verification. See Section 2702 (g). The applicant may request the Executive Officer to approve a reduced number of emission tests when extending an existing verification to other emission control groups. In reviewing this request, the Executive Officer may consider all relevant information including, but not limited to, the following:
(1) Variability in the test results used for the existing verification,
(2) Characteristics of the duty cycles in the other emission control groups,
(3) The mechanism by which the alternative diesel fuel or fuel additive reduces emissions, and
(4) Body of existing test data.

NOTE: Authority cited: Sections 39002, 39003, 39500, 39600, 39601, 39650-39675, 40000, 43000, 43000.5, 43011, 43013, 43018, 43105, 43600, 43700 and 43830.8 Health and Safety Code. Reference: Sections 39650-39675, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, 43204-43205.5 and 43830.8, Health and Safety Code; Section 71017, Public Resources Code, and Title 17 California Code of Regulations Section 93000.

Appendix B. Diesel Engine Emission Control Technology Review

There is a wide variety of technologies for controlling emissions of PM and NOx from in-use diesel engines. The following discussion briefly reviews the more common technologies in use today, and those which will likely play an important role in meeting ARB's emission reduction goals.

A. Diesel Oxidation Catalyst

A diesel oxidation catalyst (DOC) is one of the simplest aftertreatment devices available and is used in both new engine and retrofit applications. Typically using a very light loading of platinum catalyst, it is able to oxidize compounds that exist in the gas phase while in a diesel engine's exhaust system. These include carbon monoxide (CO) and, more importantly, many of the hydrocarbon (HC) species that condense into droplets and form the soluble organic fraction (SOF) of PM upon leaving the exhaust system and entering the atmosphere. By oxidizing most of the SOF in the exhaust, DOCs are typically able to reduce PM emissions by about 25 percent (Level 1). However, they do not reduce the solid soot particles in PM by any appreciable amount. Because of this limitation, DOC technology will not play a significant role in meeting California's goal of significant PM emission reductions from diesel engines.

B. Diesel Particulate Filters

A diesel particulate filter (DPF) is another type of aftertreatment device that is far more effective at reducing emissions of PM than the DOC. Its key component is a filter medium, typically a porous ceramic or sintered metal material, which permits gases in the exhaust to pass through but traps the PM. DPFs are very efficient in reducing PM emissions, typically achieving PM reductions in excess of 85 percent (Level 3). A DPF requires a means to periodically regenerate the filter (i.e., burn off the accumulated PM), and is often categorized by the nature of this means as either a passive or active DPF.

1. Passive Diesel Particulate Filters

A passive DPF is one in which a catalytic material, typically a platinum group metal, is applied to the filter itself or some other substrate upstream of the filter. The catalyst lowers the temperature at which trapped PM will oxidize to levels that are often reached in diesel exhaust, generally 250 to 400 °C, depending on the vehicle's duty cycle. No additional source of energy is required for regeneration, hence the term "passive". Most verified passive DPFs require exhaust temperatures of at least 225 to 280 °C for about 25 to 50 percent of the vehicle's duty cycle.

The simplicity of the passive DPF is both its primary selling point and its main limitation. Not requiring any special controls or external energy source, the passive DPF has simple construction and operation, and tends to be less expensive than more sophisticated control systems. To regenerate properly, however, passive DPFs require certain minimum exhaust temperatures. They are also sensitive to an engine's PM

emission rate. Unfavorable changes in either parameter can cause the filter to plug with PM and create operational problems for the engine. For these reasons, candidate vehicles need to be carefully screened before passive DPFs are installed.

2. Active Diesel Particulate Filters

Unlike passive DPFs, active DPFs use a source of energy for regeneration beyond the heat in the exhaust stream itself. Active DPF systems can be regenerated electrically, with fuel burners, or with the aid of additional fuel injection to increase exhaust gas temperature. Some active DPFs induce regeneration automatically on-board the vehicle when a specified backpressure is reached. Others simply indicate to the operator when regeneration is needed, and require the operator to initiate the regeneration process. Some active systems collect and store diesel PM over the course of a full day or shift and are regenerated at the end of the day with the vehicle or equipment shut off. A number of systems are designed such that the filters can be removed and regenerated externally at a "regeneration station."

Because regeneration is not dependent on the heat of the exhaust, active DPFs have a much broader range of application and a much lower probability of plugging than passive DPFs. However, this advantage is often accompanied by greater system complexity and cost.

C. Flow-Through Filter

Flow-through filter (FTF) technology is a form of aftertreatment that achieves PM reductions somewhere in between a DOC and a DPF. There are several very different FTF designs, but they tend to share the characteristic that they do not trap and accumulate PM like a DPF. Instead, FTFs have a medium (such as a wire mesh) that forces the exhaust into a complex flow pattern that gives rise to turbulent flow conditions or in some cases a partial trapping of PM. The medium is typically treated with an oxidizing catalyst that is able to reduce emissions of PM, HC, and CO. The particles that are not oxidized within the FTF flow out with the rest of the exhaust and tend not to accumulate. FTF performance can be highly variable and sensitive to exhaust temperature, but is normally consistent with the Level 1 or 2 classification.

D. Fuel Additives

The Procedure broadly defines fuel additives to be substances that are present in-cylinder during combustion for any of a number of different purposes, such as decreasing emissions or assisting in the operation of another diesel emission control system. One common type of fuel additive, known as a "fuel borne catalyst" (FBC), is routinely used in several countries in Europe to assist in the regeneration of DPFs. FBCs are metallic in nature (e.g., cerium, iron, and platinum) and are added in low concentrations to diesel fuel. Particles of the FBC get associated with soot particles during the combustion process and significantly lower the soot combustion temperature. FBCs can be used in conjunction with both passive and active DPFs.

E. NOx Control Technologies

Technology to control NOx emissions from in-use diesel engines has grown in its importance as a means to helping California meet its air quality goals. A number of the most common NOx control systems are briefly described below.

1. Exhaust Gas Recirculation

Exhaust gas recirculation (EGR) is an effective engine-based method for reducing NOx emissions that has been used in many new engine applications for the past five years. A valve connected to the exhaust system allows a controlled portion of spent combustion gases to circulate back into the intake system where it mixes with pre-combustion air. The exhaust serves as a diluent to lower the in-cylinder oxygen concentration and also to increase the heat capacity of the air/fuel mixture. This reduces peak combustion temperature and the rate of combustion, thus reducing NOx emissions. Though much less prevalent than EGR systems for new engines, EGR retrofits are in use both in Europe and in the United States. One such system which is combined with a passive DPF is currently verified for certain on-road engines in California. Typical NOx reductions achieved by EGR retrofits are about 40 to 50 percent.

2. Selective Catalytic Reduction Systems

Selective catalytic reduction (SCR) systems are a form of aftertreatment technology that uses a reductant, typically urea, to convert NOx to nitrogen and oxygen over a catalyst. A precise amount of reductant is injected into the exhaust upstream of the catalyst. If the reductant is well mixed with the exhaust and the exhaust temperature is adequate, (typically between 250 and 450 °C) an SCR system can achieve NOx reductions on the order of 50 to 90 percent. SCR technology is already mature in stationary applications and is beginning to emerge as a NOx control solution for in-use mobile sources.

One of the challenges facing SCR technology is the practical need to ensure that the end-user maintains a continuous supply of reductant. Urea is currently not as commercially available as diesel fuel. Also, if urea is not present in the SCR unit, it will not cause any intrinsic engine or vehicle operational problems. SCR retrofit manufacturers must therefore devise strategies to induce end-users to refill reductant tanks before they run out. Techniques such as not allowing the engine to restart or reducing the engine's power output are potential means of ensuring end-user compliance.

3. Lean-NOx Catalyst Systems

Another aftertreatment-based NOx control technology is referred to as the lean-NOx catalyst (LNC). Similar in principle to an SCR system, an LNC system relies on injection of a reductant upstream of the catalyst to reduce NOx emissions. The

reductant, in this case, is not urea but rather some form of hydrocarbon, typically diesel fuel. The NOx reductions achievable by LNC technology are sensitive to the exhaust temperature and type of hydrocarbon used, but are typically in the neighborhood of 20 to 30 percent.

Appendix C: List of Currently Verified Technologies

LEVEL 1 SYSTEMS FOR ON-ROAD APPLICATIONS

Product Name	PLUS	Technology Type	PM Reduction	NOx Reduction	Applicability
Donaldson DCM 6000	+	DOC	25%	N/A	1988-1990 on-road; CARB diesel; biodiesel.*
Donaldson 6000 + Spiracle	+	DOC + crankcase filter	25%	N/A	1988-2002 on-road; CARB diesel; biodiesel.*
Donaldson DCM 6100 + Spiracle	+	DOC + crankcase filter	25%	N/A	1991-2002; CARB diesel; biodiesel.*
Donaldson DCM 6100	+	DOC	25%	N/A	1994-2002; CARB diesel; biodiesel.*
Engine Control System AZ Purifier & Purifmuffler	+	DOC	25%	N/A	1991-2003 Cummins and Navistar on-road; 1973-1993 DDC 2 stroke; 1991-2002 HHD certain model Cummins and DDC; CARB diesel; biodiesel.*

PLUS Systems (+) indicate 2009 N02 compliance.

* These systems have been verified for use with biodiesel blends subject to certain requirements.

Note: List of verified technologies as of September 2007. An updated list can be found on the ARB website: http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm

LEVEL 1 SYSTEMS FOR OFF-ROAD APPLICATIONS

Product Name	PLUS	Technology Type	PM Reduction	NOx Reduction	Applicability
Donaldson 6000 + Spiracle (off-road)	+	DOC + crankcase filter	25%	N/A	Off-road port equipment; CARB diesel; biodiesel.*
Engine Control System AZ Purifier & Purifmuffler	+	DOC	25%	N/A	1996-2002 off-road; CARB diesel; biodiesel.*
Extengine	+	DOC + SCR	25%	80%	1991-1995 Cummins 5.9 liter off-road; CARB diesel.
Paceco Corporation		DPF	25%	N/A	Pre-1996 model year or Tier 1, 2, or 3 certified off-road diesel engines on rubber-tired gantry cranes. Biodiesel. *

PLUS Systems (+) indicate 2009 N02 compliance.

* These systems have been verified for use with biodiesel blends subject to certain requirements.

Note: List of verified technologies as of September 2007. An updated list can be found on the ARB website: http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm

LEVEL 2 SYSTEMS FOR ON-ROAD APPLICATIONS

Product Name	PLUS	Technology Type	PM Reduction	NOx Reduction	Applicability
Donaldson	+	Flow Through Filter	50%	N/A	1991-2002 on-road; CARB diesel; biodiesel.*
Environmental Solutions Worldwide Particulate Reactor™		DOC	50%	N/A	Select model years 1991-1997. Biodiesel.*
Lubrizol PuriNOx	+	Emulsified Fuel	50%	15%	1988-2003 on-road.

PLUS Systems (+) indicate 2009 N02 compliance.

* These systems have been verified for use with biodiesel blends subject to certain requirements.

Note: List of verified technologies as of September 2007. An updated list can be found on the ARB website: http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm

LEVEL 2 SYSTEMS FOR OFF-ROAD APPLICATIONS

Product Name	PLUS	Technology Type	PM Reduction	NOx Reduction	Applicability
Engine Control System AZ Purimuffler /Purifier	+	DOC + Alt Fuel	50%	20%	1996-2002 off-road; PuriNOx
Thermo King PDPF™	+	FTF	50%	N/A	1985-2002 transport refrigeration unit engines; 15 ppm sulfur diesel. Read Executive Order for detailed engine matching requirements.

PLUS Systems (+) indicate 2009 N02 compliance.

Note: List of verified technologies as of September 2007. An updated list can be found on the ARB website: http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm

LEVEL 2 SYSTEM FOR STATIONARY APPLICATIONS

Product Name	PLUS	Technology Type	PM Reduction	NOx Reduction	Applicability
Rypos ADPF	+	DPF	50%	N/A	1996-2006 stationary engines; CARB diesel.

PLUS Systems (+) indicate 2009 N02 compliance.

Note: List of verified technologies as of September 2007. An updated list can be found on the ARB website: http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm

LEVEL 3 SYSTEMS FOR ON-ROAD APPLICATIONS

Product Name	PLUS	Technology Type	PM Reduction	NOx Reduction	Applicability
Cleaire Horizon	+	DPF	85%	N/A	Most on-road diesel engines through 2006 model year; Certain MY 2006 and 1993 or older engines with OEM diesel oxidation catalysts; CARB diesel; biodiesel.* Conditionally verified for off-road engines.
Cleaire Longview		Lean NOx Catalyst and DPF	85%	25%	1993-2003 model year on-road; CARB diesel.
Donaldson DPM		DPF	85%	NA	1993-2004 on-road; CARB diesel; biodiesel.*
Engine Control System Purifilter (Low Load)	+	DPF	85%	NA	1994-2003 on-road;CARB diesel; biodiesel.*
Engine Control System Purifilter (High Load)		DPF	85%	NA	1994-2003 on-road; CARB diesel; biodiesel.*
HUSS Umwelttechnik FS-MK	+	DPF	85%	NA	Most on-road and off-road diesel engines through 2006 model year. CARB diesel; biodiesel. *
International Truck and Engine Corporation DPX		DPF	85%	NA	1994-2003 on-road Navistar (International); CARB diesel.

PLUS Systems (+) indicate 2009 N02 compliance.

* These systems have been verified for use with biodiesel blends subject to certain requirements.

Note: List of verified technologies as of September 2007. An updated list can be found on the ARB website: http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm

LEVEL 3 SYSTEMS FOR ON-ROAD APPLICATIONS

Product Name	PLUS	Technology Type	PM Reduction	NOx Reduction	Applicability
Johnson Matthey Reformulated CRT		DPF	85%	NA	1994 - 2006 on-road; CARB diesel; biodiesel.*
Johnson Matthey EGRT	+	EGR/DPF	85%	40%	2000 International DT-466, 2000 Cummins ISM 2001 Cummins ISB, 1998-2002 Cummins ISC, 2001 Cummins ISL, 2001 MY DDC - 50, and 2001 DDC - 60. on-road; CARB diesel.

PLUS Systems (+) indicate 2009 N02 compliance.

* These systems have been verified for use with biodiesel blends subject to certain requirements.

Note: List of verified technologies as of September 2007. An updated list can be found on the ARB website: http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm

LEVEL 3 SYSTEMS FOR OFF-ROAD APPLICATIONS

Product Name	PLUS	Technology Type	PM Reduction	NOx Reduction	Applicability
Cleaire Horizon	+	DPF	85%	N/A	Most on-road diesel engines through 2006 model year; Certain MY 2006 and 1993 or older engines with OEM diesel oxidation catalysts; CARB diesel; biodiesel.* Conditionally verified for off-road engines.
Engine Control System Combifilter	+	DPF	85%	NA	1996-2007 off-road; CARB diesel; biodiesel.*
Engine Control System Combifilter	+	DPF	85%	NA	1996-2007 off-road; CARB diesel; biodiesel.*
HUSS Umwelttechnik FS-MK	+	DPF	85%	NA	Most on-road and off-road diesel engines through 2006 model year. CARB diesel; biodiesel. *

PLUS Systems (+) indicate 2009 N02 compliance.

* These systems have been verified for use with biodiesel blends subject to certain requirements.

Note: List of verified technologies as of September 2007. An updated list can be found on the ARB website: http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm

LEVEL 3 SYSTEMS FOR STATIONARY APPLICATIONS

Product Name	PLUS	Technology Type	PM Reduction	NOx Reduction	Applicability
CleanAIR Permit	+	DPF	85%	NA	Stationary emergency and prime generators; CARB diesel; biodiesel.*
EGR Technologies LLC/CleanAIR Systems		EGR/DPF	85%	50%	Conditional verification for stationary prime and emergency standby generator sets and pumps ≤ 600 hp and ≤ 0.4 g/bhp-hr PM. Biodiesel.*
Johnson Matthey CRT		DPF	85%	NA	Stationary emergency and prime generators. Conditionally verified for stationary pumps.
MIRATECH Corporation	+	DPF	85%	NA	Stationary emergency and prime generators with a PM emission rate of 0.2 g/bhp-hr or less.
Rypos Inc. HDPF/C™	+	Hybrid DPF	85%	NA	1996-2007 stationary emergency standby generators and pumps with a PM emission rate of 0.2 g/bhp-hr or less and certified to Tier 1, Tier 2, or Tier 3 off-road diesel engine standards; CARB diesel; biodiesel.*
Sud-Chemie Inc. EnviCat-DPF™	+	DPF	85%	NA	Stationary prime and emergency standby generators and pumps; CARB diesel; biodiesel.*

PLUS Systems (+) indicate 2009 N02 compliance.

* These systems have been verified for use with biodiesel blends subject to certain requirements.

Note: List of verified technologies as of September 2007. An updated list can be found on the ARB website: http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm