

*State of California*  
*AIR RESOURCES BOARD*

***STAFF REPORT: Initial Statement of Reasons for Rulemaking***

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

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This report has been reviewed by the staff of the California Air Resources Board, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies for the Air Resources Board, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.



## EXECUTIVE SUMMARY

In 2000, the Air Resources Board (ARB or Board) adopted the Diesel Risk Reduction Plan (Diesel RRP) to address the health risks posed by particulate matter (PM) emissions from diesel engines. One of the key proposals identified in the Diesel RRP to mitigate these emissions requires retrofitting in-use diesel engines with diesel emission control strategies (DECS). To ensure that any DECS used achieves the goals and intents of the Diesel RRP, 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 to verify the effectiveness of a candidate DECS through emissions, durability, and field testing, and includes on-going evaluation through warranty reporting and in-use compliance requirements. The Procedure ensures that any DECS used by a regulated fleet achieves real and durable reductions of PM and oxides of nitrogen (NOx) emissions.

Although application for verification under the Procedure is voluntary, several DECS manufacturers, referred to as applicants by the Procedure and throughout this report, have recently expressed market concerns due to the global recession and recent changes to ARB's fleet rules. Delays in the implementation of several fleet rules have led to reduced sales for applicants, especially for DECS designed for off-road engines and equipment. In addition, applicants have stated that the costs associated with the in-use compliance testing requirements of the Procedure, coupled with the effects of the global recession, have created a significant financial challenge. Staff was asked to evaluate these claims and if practicable, to propose changes to the Procedure that would mitigate applicants' concerns.

Staff is proposing amendments to the Procedure which will significantly lower the costs associated with the required in-use compliance testing while maintaining the stringency and robustness of DECS to support ARB's in-use fleet rules, allow additional unit sales before this testing must begin, add less-costly in-field tests to reduce the need to remove and replace entire systems, add an alternative test schedule to further reduce in-use testing requirements, streamline the in-use compliance process to provide applicants with additional flexibility, extend the time allowed to complete a conditional off-road verification, provide the Executive Officer with recall authority, improve and clarify the application and review process, clarify safety demonstrations, and address several in-field issues. The amendments proposed by staff will:

- Reduce in-use testing costs by replacing one phase of in-use compliance emissions testing with in-field testing
- Significantly increase the sales triggers that determine when in-use testing must begin
- Add functional testing to reduce the need to remove and replace entire systems for in-use compliance emissions testing
- Further reduce in-use testing costs by providing a pathway to complete in-use compliance using only one phase of testing

- Streamline the in-use compliance process
- Extend the time allowed to complete a conditional off-road verification
- Ensure the same level of end-user protections by adding recall provisions
- Further define the verification application and review process
- Add additional, more explicit pre-installation assessment and installer requirements for clarity
- Clarify the high backpressure notification requirements
- Clarify safety testing requirements
- Add additional allowances for restricted use emergency standby engines
- Clarify the warranty reporting requirements and require installers to begin submitting an annual installation warranty report
- Clarify the attributes of an emission control group and the selection of test engines
- Clarify the testing requirements for alternative fuels and fuel additives
- Provide other corrections and clarifications

Reducing the amount of laboratory type in-use compliance testing required by the Procedure will greatly ease the financial burden to applicants. The current Procedure requires two phases of in-use testing in an emissions laboratory. Staff's proposal replaces one phase of emissions laboratory dynamometer-based in-use testing with less expensive field testing. In addition, the proposal includes an option that would allow applicants to move directly to in-use emissions testing allowing them to complete their in-use compliance requirements with only one phase of testing. Also, to better ensure high levels of protections are afforded to the end-users of retrofit devices, staff has included recall provisions, clarified safety testing requirements, and clarified the warranty reporting requirements for applicants and installers. These changes, along with increasing the sales thresholds, adding in-field functional tests, and extending the time required to complete a conditional off-road verification, should provide significant financial relief to applicants while maintaining the stringency and robustness of the verification program.

Requiring installers of verified devices to begin submitting an annual installation warranty report will result in an additional cost for all installers, but this is not anticipated to be significant and the required reports will help ensure that installers are honoring the warranty requirements and better identify installation issues before they become significant. In addition, staff's proposal clarifies the application and review process, the high backpressure notification requirements, the attributes that should be addressed when determining an emission control group, and includes guidance on the selection of test engines. These changes are designed to provide additional information for applicants of new verifications and better define the requirements of the Procedure. Staff's proposal adds a more specific assessment that will help determine a candidate engines' suitability prior to retrofit, and includes more explicit requirements to ensure installers and end-users are properly trained regarding the operation and maintenance of these devices. These last changes are being proposed to ensure the effectiveness of this technology and to protect the purchasers of retrofit devices. Staff's proposal also clarifies the warranty reporting requirements by defining what constitutes a warranty

claim, what applicants and installers are expected to report, and how to determine when a supplemental report may be required. Additionally, staff's proposal clarifies the testing and labeling requirements for strategies that employ either alternative diesel fuels or fuel additives. Finally, staff has included allowances for restricted use emergency standby engines designed to address issues associated with the pre-installation compatibility assessment requirements.

While the proposed amendments have no direct emissions benefits, they ensure that the Procedure continues to provide verified emission control devices that enable other ARB rules to achieve greater reductions in diesel PM and NO<sub>x</sub> emissions. The Procedure will help ARB in its efforts to implement the Diesel RRP and better protect public health. In addition, several of the proposed amendments provide indirect emissions benefits by ensuring better installation and maintenance practices.

The proposed amendments to the Procedure would provide substantial financial relief to the DECS industry by reducing the amount of required in-use compliance testing by up to one-half and allowing additional unit sales before this testing is required. Streamlining the process and adding additional in-field tests will further reduce the costs associated with the in-use compliance requirements. The addition of the proposed recall provisions and the proposed amendment requiring the submission of an annual installation warranty reports are necessary to maintain the stringency of the Procedure and to ensure the in-use performance of DECS. These proposed changes may offset some of the cost savings from the proposed changes to the in-use compliance requirements. The remaining amendments represent procedural changes and clarifications and should not result in any significant economic impacts. Overall, the proposed amendments are estimated to provide a savings to industry of approximately \$2.1 million to \$5.6 million.

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# CHAPTER I

## BACKGROUND

### A. INTRODUCTION

This report with associated appendices represents the Initial Statement of Reasons (ISOR) for Proposed Rulemaking required by the California Administrative Procedures Act. In this report, the Air Resources Board (ARB or Board) staff describes proposed amendments to the *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines* (the Procedure) which is codified in the California Code of Regulations (CCR), Title 13, sections 2700-2711. The Procedure, developed to support California's Diesel Risk Reduction Plan (Diesel RRP), is used to verify the emissions reduction capabilities of candidate diesel emission control strategies (DECS) and ensures that they remain durable throughout their warrantable life.

Regulations adopted implementing the Diesel RRP and the State Implementation Plan (SIP) require fleets to retrofit or replace their diesel engines in vehicles and equipment operated in the State, referred to as fleet rules. To meet these fleet rules, fleets may elect to retrofit their existing engines or turnover their fleets to newer, cleaner engines. If they elect to retrofit they are required to use a DECS verified by ARB under the Procedure. The verification program is therefore a critical element of the Diesel RRP and the SIP.

### B. DIESEL PM AND THE ESTABLISHMENT OF THE VERIFICATION PROCEDURE

In 1998 ARB identified diesel particulate matter (PM) as a toxic air contaminant. A toxic air contaminant is an air pollutant that may cause or contribute to an increase in mortality or serious illness, or which may pose a present or potential hazard to human health. Diesel PM is of particular concern because it is distributed over large regions, thus resulting in widespread public exposure.

Diesel PM is the largest contributor to health risk posed by toxic air pollutants, constituting approximately 70 percent of the total statewide risk<sup>1</sup>. To address this large-scale health concern, ARB adopted the Diesel RRP in 2000 (ARB, 2000). One of the primary goals of the Diesel RRP is to reduce emissions of diesel PM from California's existing in-use fleet through the implementation of various fleet rules. The Diesel RRP outlines measures to protect public health that include the use of diesel emission control

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<sup>1</sup> ARB, 2000. *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles*. <http://www.arb.ca.gov/diesel/documents/rrpFinal.pdf>. Accessed December 6, 2011

strategies, or “DECS”, with existing diesel vehicles and equipment in on-road, off-road, and stationary applications, as well as other diesel powered applications. To date, ARB has adopted fleet rules covering 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), transport refrigeration units (title 13, CCR, section 2477), off-road diesel equipment (title 13 CCR, section 2449 et seq.), and private on-road diesel vehicles (title 13, CCR, section 2025 et seq.). To be able to implement those measures, ARB must first verify that candidate emission control technologies are effective in reducing emissions and remain durable throughout their useful life.

In response to that requirement, ARB staff developed the Procedure to verify systems that provide real and durable reductions in diesel PM emissions. The Board adopted the Procedure at a public hearing held on May 16, 2002, and has subsequently amended it several times since. The Procedure represents a cooperative inter-divisional effort within ARB and though the primary function of the Procedure is to support the Diesel RRP, it also quantifies oxides of nitrogen (NO<sub>x</sub>) reductions in light of California’s persistent ozone problem and in support of its SIP commitments. The Procedure encompasses on-road, off-road, stationary, and marine applications, as well as DECS specifically designed to work with Transport Refrigeration Units, Auxiliary Power Units, and diesel powered cargo handling equipment. The Procedure is designed to evaluate a broad range of technologies, including aftertreatment systems, alternative diesel fuels, and fuel additives. It establishes emission and durability testing requirements that applicants must meet in order for their products to receive verification, specific procedures for quantifying their level of effectiveness, and establishes warranty and in-use compliance testing requirements.

### **C. OVERVIEW OF THE VERIFICATION PROGRAM**

The verification process, as defined by the Procedure, ensures DECS used to satisfy fleet rule requirements achieve real and durable emissions reductions. An applicant seeking to verify a DECS must satisfy emissions testing, a durability demonstration, meet specific warranty requirements, and after DECS has been in operation for a specified period of time, meet the in-use compliance requirements of the Procedure.

Currently, to initiate the verification process, an applicant first submits a preliminary application containing detailed information describing the product, including the scientific and engineering basis of how the product works, and information regarding how they will comply with the testing requirements of the Procedure. 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 any additional issues unique to the system that must be addressed over the course of the verification. Verification requires that testing and other submitted information supports the emissions control group (those engines and

applications that will be covered by the verification) and demonstrates successful system performance.

Following verification, applicants must honor the warranty and in-use compliance requirements of the Procedure. Applicants must submit annual warranty reports to ARB which provide summaries of warranty claims, production and sales information of systems sold or leased in California, and descriptions of the nature of the claims and what actions were taken by the applicant to address them.

### **1. Other Verification Programs**

U.S. EPA administers another well-known voluntary retrofit program as part of their National Clean Diesel Campaign (NCDC). Authorized as part of the Energy Policy Act of 2005, U.S. EPA's voluntary retrofit program is similar to ARB's and is designed to encourage owners of fleets of diesel powered vehicles and equipment to retrofit their engines with verified DECS. The Diesel Emissions Reduction Act (DERA) authorizes funding to help fleet owners reduce these emissions. U.S. EPA's program evaluates diesel emission reduction technologies through emissions and durability testing. Verified technologies are listed on the NCDC website at: <http://epa.gov/cleandiesel/verification/verif-list.htm>. After receiving verification, applicants are still responsible for meeting in-use compliance requirements similar to the Procedure, but U.S. EPA's program has no warranty requirements.

Another well-known program used to evaluate diesel emission reduction technologies is called Verminderung der Emissionen von Realmaschinen im Tunnelbau (VERT). VERT program is a testing procedure required by the Swiss Agency for the Environment, Forests, and Landscape and the Swiss occupational health agency 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. Verified technologies are listed on VERT website at: [http://www.vert-certification.eu/attachments/048\\_VERT-Filter-List\\_October\\_2010.pdf](http://www.vert-certification.eu/attachments/048_VERT-Filter-List_October_2010.pdf).

### **D. LEGAL REQUIREMENTS**

ARB has authority under California law to adopt the proposed regulatory amendments. California Health and Safety Code sections 43000, 43000.5, 43013(b) and 43018 provide broad authority for ARB to adopt emission standards and other regulations to reduce emissions from new and in-use on-road vehicular and other mobile sources. Under Health and Safety Code sections 43013(b) and 43018, ARB is directly authorized to adopt emission standards for off-road vehicular sources, as expeditiously as possible, to meet State ambient air quality standards. ARB is further mandated by California law under Health and Safety Code section 39667 to adopt Air Toxic Control Measures for new and in-use vehicular sources, for identified toxic air contaminants, such as diesel PM.

Under federal and California law, ARB is the primary agency in California responsible for making certain that all regions of the State attain and maintain National Ambient Air Quality Standards. To achieve this, California must adopt all feasible measures to obtain the necessary emission reductions, including measures for new and existing stationary and mobile sources.

## **E. PROBLEM**

ARB received a request from DECS manufacturers, referred to as applicants by the Procedure and throughout this report, to evaluate the economic impact of recent changes to the fleet rules and the on-going global recession. Due to the fleet rule changes, current California Occupational Safety and Health Program (Cal/OSHA) requirements for off-road vehicles and engines, and the global recession, sales of DECS have significantly declined for most applicants. Through the applicants' industry group, the Manufacturers of Emission Controls Association (MECA), several alternatives to the current in-use compliance requirements were proposed in an effort to reduce the costs associated with the Procedure. Staff evaluated these proposals and used them as the basis for the proposed amendments. In addition, staff has included additional proposed amendments designed to: better define the application and review process for new verifications, clarify the high backpressure notification requirements, clarify the attributes that define an emission control group, provide additional guidance regarding the selection of test engines, add a more defined pre-installation assessment to better ascertain an engine's suitability prior to retrofit, ensure installers are properly trained, clarify safety testing requirements, clarify the warranty reporting requirements, clarify the testing and labeling requirements for fuel-based strategies, provide allowances for restricted use emergency standby engines, and other clarifying language designed to provide improved support for the fleet rules. The proposed amendments are necessary to reduce the cost to currently verified and future applicants, to streamline the in-use compliance process, and to update the Procedure.

## **F. PURPOSE AND BENEFITS OF THE REGULATION**

The purpose of the proposed amendments is to provide economic relief to applicants to the Procedure, to streamline the in-use compliance process, and to update the Procedure. Due to declining DECS sales, applicants to the Procedure have expressed market concerns and proposed several alternatives to the current in-use compliance testing requirements with the intent of reducing the costs of the required testing. Staff evaluated these proposals and used them as the basis for the proposed amendments.

The proposed amendments would provide significant financial relief to the applicants and streamline the in-use compliance requirements. The proposed amendments would also better define the application and review process, clarify the high backpressure notification requirements, clarify the attributes that define an emission control group, provide additional guidance regarding the selection of test engines, add a more defined

pre-installation assessment to better ascertain an engine's suitability prior to retrofit, ensure installers are properly trained, clarify safety testing requirements, clarify the warranty reporting requirements, clarify the testing and labeling requirements for fuel-based strategies, provide allowances for restricted use emergency standby engines, and provide applicants additional time to complete an off-road conditional verification.

The proposed amendments would provide financial savings to all applicants by reducing the amount of required in-use compliance testing by up to one-half and allow additional sales before this testing is required. The addition of functional in-field tests and the alternative test schedule further reduces the costs associated with the in-use compliance requirements. Streamlining the in-use compliance process and providing additional time for applicants to complete their conditional verifications provides even greater financial flexibility. The addition of recall provisions and clarifications to the warranty reporting requirements are necessary to maintain the stringency of the Procedure and to protect end-users. The proposed amendments provide the economic flexibility requested by applicants while maintaining the effectiveness of the Procedure and ensuring that end-users of these devices remain protected. Overall, the proposed amendments are expected to reduce DECS industry's costs associated with verification by \$2.1 million to \$5.6 million for currently verified systems. For a more detailed discussion of the impacts and benefits of the proposed amendments, see Chapter VII.

## **G. PUBLIC PROCESS**

In order to facilitate public comment during the development of the proposed amendments, staff held two public workshops at ARB offices located in El Monte that were well attended by applicants, device installers, and other stakeholders. The dates and materials presented at the workshops are available on ARB's Verification Procedure website at <http://www.arb.ca.gov/diesel/verdev/verdev.htm>. Staff also held several meetings with MECA and individual companies to discuss the proposal. Based on these meetings, staff was able to incorporate input from stakeholders in the development of this proposal. Staff considered several alternatives to the proposal but concluded that the proposed amendments offer the best means of providing economic flexibility to applicants while maintaining strong end-user protections and the integrity of the Procedure.

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## CHAPTER II

### DESCRIPTION OF PROBLEM, PROPOSED SOLUTIONS, AND RATIONALE FOR EACH PROPOSED AMENDMENT

#### A. INTRODUCTION

The following sections describe the general provisions of the existing Procedure, the problems identified during the public process, the proposed solutions, and the rationale for each proposed amendment.

#### B. IN-USE COMPLIANCE REQUIREMENTS

To provide protections to end-users of ARB verified DECS, the Procedure requires applicants conduct in-use compliance testing to validate that units sold to end-users are as effective as those tested for verification and to make sure that in-use systems are functioning in terms of their required emissions reductions and durability throughout the required warranty period. Currently, in-use compliance testing must begin when 50 units of a given DECS family have been sold or leased in the California market. The Procedure specifies the same type of laboratory based emissions testing (typically dynamometer testing) applicants performed to receive their initial verification. Testing is conducted in 2 different phases for each DECS family and applicants are required to submit an in-use compliance testing proposal for review and approval by ARB's Executive Officer before any testing is performed. Currently, phase 1 testing proposals are due no later than 90 days after selling the 50<sup>th</sup> unit and the phase 2 proposals within 3 years. Applicants must test a minimum of 4 candidate test units per DECS family for each phase. These are units that have been deployed into service and are in actual use by end-users. In the event that one of the 4 candidate test units fails, applicants must test 2 additional units for each failure, but are allowed to test no more than 10 units per DECS family. The conditions for passing in-use compliance testing are that the first 4 test units must meet the applicable emissions standards, or if more than 4 units are tested, at least 70 percent of all units tested must meet the standards. Following each phase of testing applicants must submit an in-use compliance report to the Executive Officer: for phase 1 testing this report is due within 18 months of selling the 50<sup>th</sup> unit, and for phase 2, within 4 years.

The current sales trigger of 50 units, coupled with the requirement that applicants select candidate test units for in-use testing that have been operated for 25 percent of their minimum warranty period or for one year was designed to resolve any problems associated with DECS before having widespread application of these systems in the market. However, retrofit technologies have matured significantly since the adoption of the Verification Procedure. While in-use testing is still necessary to validate the

durability and emission performance of these strategies, staff believes that functional in-field testing rather than dynamometer-based emissions testing is sufficient to initially identify performance issues associated with newly verified systems. This is based on staff's field testing experience and information from DECS manufacturers, where DECS inspection and functional testing has provided the ability to ensure that the system is being operated properly and functioning according to its verification. This process has also had the added benefit of identifying concerns in the field between the operator, installer, and DECS manufacturer. DECS manufacturers have also indicated that if they experience issues with their systems that most of these issues generally occur soon after an applicant enters the marketplace (i.e., initial year of production), and are typically readily identified through comprehensive field testing.

Staff's proposal continues to require 2 phases of testing but replaces the more costly Phase 1 dynamometer-based laboratory emissions testing with field testing. For field testing, rather than removing the DECS for testing in an emissions testing facility, applicants will be required to perform less expensive specific visual and functional tests in field to verify that their emission control systems continue to remain functional and durable. This will greatly reduce the costs of in-use compliance testing by replacing one phase of dynamometer-based emissions testing with in-field tests. While functional in-field testing cannot quantify a DECS specific emissions reduction levels, it can identify performance issues before widespread application of these mature technologies is achieved at a lower cost to all applicants. All applicants will still be required to perform full emissions testing to validate verified emissions reduction levels, but at a later date during their second phase of testing. This proposed change will reduce the cost of compliance for current and future applicants to the Procedure.

Along with this proposed change, staff has included an alternative test schedule that provides an option to complete in-use compliance testing using only one set of in-use compliance tests, but requires applicants to move directly to the more costly emissions testing. The alternative test schedule would allow applicants an option to complete their required in-use compliance testing by performing only one set of in-use compliance tests, provided they agree to perform emissions testing after reaching the first sales trigger. The alternative test schedule would be performed in place of the less costly field testing provided applicants can identify and select test units that have been operated for at least 60 percent of their minimum warranty period or for three years. This option, performed after reaching the lower sales trigger, would provide both early identification of any potential performance issues and validation of verified emissions reduction levels. This provides applicants with an option to further reduce compliance costs by eliminating the need for future emissions testing.

To further assist applicants to the Procedure, staff is also proposing to increase the number of units that trigger when the in-use compliance process must begin. Rather than requiring in-use testing after the sale or lease of 50 units, staff's proposal provides for in-use field testing after the sale or lease of 100 units, and in-use compliance emissions testing after the sale or lease of 300 units. This will provide applicants

additional time to prepare for in-use testing. For more information on the rationale used to select these proposed sales triggers, please see Appendix B.

Most applicants are meeting the 50 unit sales trigger less than a year after receiving verification. Performing an additional set of emissions tests shortly after an applicant's initial verification testing is costly and uninformative, especially if in-use compliance testing is triggered too soon after an applicant enters the marketplace. However, the trigger to start in-use testing must be set such that it will not significantly delay testing, which could result in potential problems not being identified until a significant number of units have been deployed. Overall, staff believes that in-use testing should be required so that the results are available to staff before the warranty period for an applicant's initial post-verification sales has expired. These larger sales triggers will continue to provide staff with in-use compliance test results before an applicant's initial sales have exceeded their minimum warranty period, which is generally 5 years. Staff is proposing these changes to address these issues and to further reduce each applicant's per unit overhead costs. Applicants will have more time and profit from the sale of additional units allowing them to better prepare for the Procedure's mandatory in-use compliance testing.

Some DECS use an entirely fuel-based approach to achieve their emissions reductions. For entirely fuel-based strategies, there are no components or parts that would constitute a sales unit so staff's proposed sales triggers don't apply. To address this, staff is proposing a maximum threshold coupled with a time requirement that will ultimately trigger when in-use compliance testing must begin: when 6 million gallons of an alternative or treated diesel fuel has been used or 3 years after receiving verification, whichever comes first. This will allow one volume requirement to suffice for both types of entirely fuel-based strategies, additives or alternative fuels, and provide a time-limit to ensure in-use testing is performed in a timely manner. However, unlike a hardware-based strategy, staff does not believe that field testing is a viable option for entirely fuel-based DECS. For entirely fuel-based strategies, there are no components to visually inspect, nor are there any sensors or displays to test for functionality. Therefore, it is proposed that entirely fuel-based DECS only be required to perform in-use compliance emissions testing after meeting either the proposed sales trigger or 3 years after receiving verification, whichever comes first.

Finally, staff thoroughly reviewed the remaining in-use compliance testing requirements to determine if any other changes were feasible that might provide applicants with lower compliance costs without compromising the integrity of the in-use testing program. Staff was able to identify two additional changes: allowing applicants to perform functional tests of supporting system components during in-use compliance emissions testing rather than the current practice of removing and replacing the entire system, and providing an option that allows applicants to request the use of only one size of emissions test engine provided it can be used to demonstrate compliance for the entire DECS family. Therefore, these proposed changes are also included in staff's proposal.

The remaining proposed amendments to the Procedure's in-use compliance requirements are necessary to implement staff's proposed field testing provisions, support the increased sales triggers, support functional testing of supporting system components and the use of one emissions test engine, and to clarify and streamline the process. These proposed amendments include:

*Test Phases.* The Procedure currently requires 2 phases of testing identified as Phase 1 and Phase 2. This naming convention is no longer appropriate based on staff's proposed amendments. Therefore, staff proposes identifying what was previously Phase 1 as "field testing", and Phase 2 as "emissions testing". This naming convention aligns with staff's proposal and provides clarity for applicants to the Procedure.

*Age of Test Units.* For in-use compliance testing, the Procedure currently requires applicants to identify and select test units from actual in-use vehicles or equipment that have been operated, or "aged", as follows: for Phase 1 the test units must have been operated at least 25 percent of their minimum warranty period or for 1 year, whichever comes first, and for Phase 2, between 60 and 80 percent of their minimum warranty period. For field testing, no change in the age of the test units is required. However, for emissions testing, applicants have stated that locating test units that fall within the required 60 to 80 percent window is difficult. To streamline the selection process, staff's proposal specifies that test units selected for emissions testing must be operated at least 60 percent of their minimum warranty period or for 3 years, whichever comes first. This broader range with respect to the minimum warranty period or elapsed time will make identifying and selecting test units easier for all applicants.

*In-Use Compliance Testing Proposal.* The Procedure requires applicants to begin the in-use compliance process by submitting an in-use compliance testing proposal to ARB's Executive Officer for review and approval. The current language requires applicants to submit their proposal 90 days after selling the 50<sup>th</sup> unit for Phase 1 testing and no later than 3 years after selling the 50<sup>th</sup> unit for Phase 2. To support the increased sales triggers it is necessary to change the submission times to align with staff's proposed amendments. Therefore, staff's proposal provides applicants 90 days in which to submit their proposals for Executive Officer review and approval after reaching the appropriate sales trigger. Staff's proposal also includes language detailing the type and level of information necessary for a prompt and successful review of an applicant's testing proposal. These changes align the submission deadlines with staff's proposal and streamline the existing in-use compliance testing proposal development and review process.

*Selection of Diesel Emission Control Strategies for Testing.* The Procedure requires applicants to identify a representative sample of installed DECS for potential in-use testing. Currently, applicants are identifying 10 units as this is the maximum number of systems that may be tested per DECS family. However, the Procedure does not define what constitutes a representative sample, nor does it state that this representative sample must consist of 10 systems. To address this, staff's proposal requires applicants identify 10 installed DECS for possible in-use testing (both field and

emissions testing) and provides guidance on how to determine a representative sample. These proposed changes will streamline the process, clarify the requirements for applicants, and ensure that the required information is submitted in each testing proposal.

*Selection of Test Engines.* The Procedure currently requires applicants to select a test engine or engines for in-use compliance emissions testing that are in a proper state of maintenance but does not define this term. For clarity, staff added language to this section to identify what constitutes a proper state of maintenance for an emissions test engine.

*Number of DECS to be Tested.* Currently, applicants are required to test a minimum of four candidate test units for each Phase of in-use compliance testing and test two additional units for each failure up to a maximum of ten. Staff's proposed in-use compliance emissions testing makes no changes to these requirements. However, staff's proposed field testing makes a quantitative comparison with the original test units used for verification difficult. To align with staff's field testing proposal an increase in the test sample size is necessary to ensure that the required testing can identify potential performance issues for all systems in an applicant's DECS family. Therefore, staff's proposal requires applicants to test a minimum of eight candidate test units for field testing and test two additional units for any failure up to a maximum of ten. By requiring that a sufficient number of DECS are tested during field tests, potential performance issues will be identified thus ensuring the same level of protection for the end-users of these devices that the Procedure currently provides while reducing overall compliance costs.

*In-Use Compliance Field Testing.* To support staff's proposal it is necessary to add additional language to the Procedure describing the general requirements for the field testing provisions. This section describes the general requirements and instructs applicants to develop a test methodology that they can use in-field to determine if their DECS family continues to remain durable, functional, and is successfully reducing emissions. Staff's proposal requires applicants to submit their proposed test methodology to the Executive Officer for review and approval prior to performing field tests. The proposed changes will provide necessary guidance and clarity for applicants to the Procedure and the addition of field tests will reduce in-use testing costs for all applicants.

*In-Use Compliance Emissions Testing.* To support staff's proposal to allow functional testing of supporting components prior to removal of the core components of the system for emissions testing, staff added additional language to this section identifying the general requirements for developing these tests. Staff's proposal requires applicants to submit their proposed functional tests as part of their testing proposal for Executive Officer review and approval prior to in-use compliance emissions testing. The proposed changes provide necessary guidance to applicants of the Procedure and the functional testing option will result in reduced in-use compliance costs.

*In-Use Compliance Report.* To support the proposed sales triggers, the change in the naming convention, and to address entirely fuel-based strategies, staff's proposal modifies this section. Currently, the Procedure requires applicants to submit their Phase 1 report within 18 months after meeting the 50 unit sales trigger and then the Phase 2 report within 4 years. Additionally, the Procedure does not specifically mention how entirely fuel-based strategies are to make this determination. To address these issues staff's proposal requires applicants to submit their field or emissions testing in-use compliance reports no later than 18 months after meeting the appropriate sales trigger. Staff's proposal also requires applicants of entirely fuel-based strategies to submit their in-use compliance report no later than 18 months after 6 million gallons of an alternative or treated diesel fuel has been used or 3 years after receiving verification, whichever comes first. These proposed changes are necessary to align this section with staff's current proposal.

*Conditions for Passing In-use Compliance Testing.* Staff is proposing changes to the conditions for passing in-use compliance testing to address the proposed field testing requirements and the addition of functional tests. Currently, an individual DECS meets the requirements for passing in-use compliance for either Phase of testing if it reduces emissions by at least 90 percent of the lower bound of the emission reduction level it was originally verified to and meets the nitrogen dioxide (NO<sub>2</sub>) requirements of the Procedure. In addition, each DECS family name passes in-use compliance testing if the first 4 units meet these requirements or if more than 4 units are tested, 70 percent of all units tested must meet the requirements. For in-use compliance emissions testing, staff's proposal adds an additional requirement stipulating adherence to the functional test requirements defined in the applicants approved emissions testing proposal. For in-use compliance field testing, staff's proposal requires either the first 8 units tested to meet the functional test requirements defined in the applicants approved field testing proposal or if more than 8 units are tested, a minimum of 9 units must meet these requirements. The proposed changes are necessary to align the conditions for passing in-use compliance with staff's current proposal.

## **C. CONDITIONAL VERIFICATION**

Conditional verification allows applicants to market their products as ARB verified prior to receiving full verification after completing only one-third of the required minimum durability demonstration period. Applicants must complete the remaining demonstration period within one year after receiving conditional verification. One of the effects of the global recession is a significant slowdown in construction and construction related industries. This sector provides that greatest opportunity for applicants seeking an off-road durability demonstration vehicle.

In an effort to provide additional economic relief to applicants to the Procedure, staff proposes allowing conditionally verified off-road strategies an additional year to fulfill the requirements necessary to achieve full verification. The Procedure currently allows applicants to conditionally verify DECS intended for off-road, stationary, marine,

Rubber-Tired Gantry (RTG) crane, Auxiliary Power Unit (APU), and Transport Refrigeration Unit (TRU) applications. Therefore, staff's proposal extends the time for applicants of conditionally verified off-road strategies to complete the requirements for full verification to two years. This proposed change will allow applicants additional time to complete this work while profiting from an additional year of sales.

#### **D. RECALL PROVISIONS**

To ensure that end-users of verified devices are provided with the same level of protections that the Procedure's current in-use compliance requirements offer, and to address safety issues or the potential for catastrophic failure, staff's proposal provides the Executive Officer with recall authority. While the proposed changes to the in-use compliance requirements provide economic relief to all applicants, the increased sales triggers will result in additional units being deployed in-field before in-use testing is required. Though staff's proposed changes to the in-use compliance testing requirements are sufficient to identify potential performance issues, once identified, the only recourse available to deal with them are to request a voluntary recall, lower an applicant's verification level, revoke their verification entirely, and/or assess monetary penalties for a violation of the Procedure. This does little to provide relief to end-users and may not address all systems that remain deployed on vehicles and engines of in-use fleets. Similarly, issues of safety or catastrophic failure, high warranty claim rates, or other serious problems identified with deployed systems can only be addressed in the same fashion. To address these issues, staff's proposal includes new recall provisions.

The intent of the proposed recall provisions is to require corrective action by an applicant to the Procedure for a systemic defect of their DECS family or to address issues of safety or catastrophic failure. Staff's proposal provides the Executive Officer with the authority to determine whether the recall of a DECS family is appropriate based on a review of an applicant's in-use compliance report, remedial report, warranty report, enforcement testing results, or other information. Staff's proposal clarifies that this determination will be based on: the potential for catastrophic or other safety related failures, failure to meet the conditions for passing in-use compliance testing, valid warranty claims for the same part or component that exceed 4 percent of the number of deployed systems, or if a substantial number of units experience a failure of an operational feature (e.g., strategy used to signal high backpressure). If the Executive Officer determines that a recall is necessary to address one or more of these systemic defects, applicants will be required to submit a recall plan within 60 days specifying potential remedial actions. Staff's proposal also specifies that the proposed recall provisions apply to an applicant's entire DECS family, which may include all strategies sold as California verified. A complete discussion of the proposed recall provisions, including the minimum requirements for an applicant's recall plan, can be found in Chapter VII of this report. The proposed recall provisions are necessary to support staff's proposed changes to the in-use compliance requirements, to address safety

issues or the potential for catastrophic failure, and to better protect end-users of these devices.

## **E. WARRANTY REQUIREMENTS**

The procedure currently requires applicants to warrant their verified products and specifies minimum warranty periods by DECS application. Staff's proposal clarifies the existing warranty requirements to ensure that all applicants to the Procedure are aware that they must extend this coverage to components used to match DECS to the target engine. This clarification is needed to ensure that end-users of these devices are fully protected by the existing warranty requirements. The Procedure also requires applicants to submit an annual warranty report to the Executive Officer and staff has added clarifying language to identify the type of information that should be submitted by applicants. These changes are necessary to streamline the process, clarify the requirements, and ensure that the required information is submitted by all applicants.

The Procedure currently also requires applicants to submit a supplemental warranty report within 30 days if warranty claims exceed a 4 percent threshold. However, the threshold requiring the supplemental report is ambiguous and requires further clarification. Staff's proposal clarifies this requirement by defining that the 4 percent threshold applies to claims received for the same part or component, and is only determined based on valid warranty claims. Staff's proposal also defines 2 new terms to further clarify the requirement: warranty claim and valid warranty claim. These changes are necessary to clearly define the requirements, ensure reports are submitted when appropriate, and to support staff's proposed recall provisions. As previously discussed, exceeding the 4 percent threshold may subject an applicant's DECS family to the proposed recall provisions.

In addition to the product warranty, the Procedure currently requires installers of verified DECS to provide end-users with warranty protections. Though the warranty period is the same as the product warranty provided by applicants, installers are only required to warrant that the installation is free from defects in materials and workmanship. During the public process several installers indicated that the terms of coverage are not clearly defined, therefore staff's proposal clarifies the installation warranty requirements to assist installers. Staff's proposal also includes a new provision requiring installers to begin submitting annual installation warranty reports and to share this information with the applicant (DECS manufacturer) for which they are authorized to install. Installers are often the main point of contact for end-users and the Procedure has always assumed that any requests for warranty service would be forwarded to the appropriate applicant (DECS manufacturer) and would therefore appear in their annual warranty report. However, during the public process staff was made aware that this is not always the case. To address this problem staff's proposal requires installers of verified DECS to submit an annual installation warranty report. These changes are necessary to clarify the requirements, identify potential installation issues, and ensure that the required

information is submitted by all installers to their respective applicants and the Executive Officer.

## **F. PRE-INSTALLATION COMPATIBILITY ASSESSMENT**

The Procedure currently includes pre-installation compatibility assessment procedures. These assessments help ensure that candidate engines are properly screened prior to retrofit. In order for a verified DECS to function as designed, the candidate engine must be operating properly. The pre-installation compatibility assessment procedures are designed to identify mechanical problems with the candidate engine that must be corrected prior to retrofit. However, even with the recent adoption and implementation of some basic assessment procedures, in-field problems are still being reported by fleets and individuals. Several of these reports seem to indicate that candidate engines were retrofit even though they were likely in a very poor state of maintenance. To address this staff's proposal adds additional requirements to the pre-installation compatibility assessment procedures to better assess the condition of the candidate engine prior to retrofit.

Staff's proposal requires applicants to the Procedure to establish specific criteria that installers will use to assess each engine prior to retrofit and specifies minimum criteria such as: a smoke opacity limit, oil consumption limits, fuel inspection requirements, and visual inspections. Because these assessments must identify each candidate engine's current state of maintenance, staff's proposal stipulates that installers must perform these checks no more than 15 days prior to retrofit. Also, to address currently verified DECS, staff's proposal requires applicants of currently verified systems to establish and implement the enhanced assessment criteria within six months following the adoption of the regulation. These changes are necessary to ensure that any mechanical problems experienced by a candidate engine are identified and appropriately addressed prior to its retrofit.

In addition to assessing the mechanical condition of the candidate engine prior to retrofit, the Procedure requires measurement of its exhaust gas temperature if it is to be retrofit with a DECS that has an exhaust gas temperature requirement. Most passive systems have a minimum temperature threshold that must be met for successful operation. This is determined by measuring the exhaust gas temperature for a minimum of 24 hours during normal operation. Staff's proposal clarifies that this measurement must occur during the most challenging pattern of use and that end-users must be notified that any significant change in this pattern of use could result in performance issues with their DECS. In addition, staff was made aware during the public process that the restricted use requirements of some emergency standby engines make operating the engine for the minimum 24 hour assessment period problematic. Therefore, staff has added a new provision that allows owners of emergency standby engines permitted by a California Air District the option of proposing a period of less than 24 hours to the Executive Officer for these types of temperature assessments. These changes are necessary to ensure that the exhaust gas

temperature requirements are appropriately assessed, that end-users understand the significance of these requirements, and that emergency standby engines subject to the fleet rules have the ability to select retrofit as a potential compliance option.

## **G. INSTALLER REQUIREMENTS AND END-USER TRAINING**

Staff's proposal requires applicants to the Procedure to provide added oversight during the installation of their verified strategies and includes additional requirements for installers. The proposed changes require applicants to develop criteria they will use to begin authorizing installers of their products and specifies that no person or company may install an ARB verified DECS unless trained and authorized by the party that holds the verification. In addition, staff's proposal clarifies that installers must comply with the enhanced pre-installation compatibility assessment requirements, must provide an installation warranty, and includes general requirements that all installers must adhere to. Currently, anyone may install an ARB verified DECS with little or no training and limited contact with the party that holds the verification. This has led to poor installation practices that result in problems in the field and dissatisfied end-users. These changes are necessary to ensure that verified DECS are properly installed and that all the terms and conditions of verification Executive Order are being addressed by both applicants and installers. In addition, to ensure that end-users are properly trained in the use and maintenance of these systems, staff's proposal includes provisions that require basic end-user training following installation. While all applicants are currently providing some level of end-user training these changes are necessary to specify minimum training requirements that must be met by either the applicant or their authorized installer thus ensuring that end-users can safely and effectively operate and maintain these systems.

## **H. APPLICATION AND REVIEW PROCESS**

Staff's proposal includes clarifications and additional specificity to the application and review process currently used by staff to evaluate an applicant's DECS. The proposed changes are designed to better identify the procedures followed by staff and delineate the process into clearly defined categories that applicants must follow. During the public process applicants requested a review of the current Procedure with the intent of streamlining the application and review process if possible and staff's changes are in response to this request. These changes will also help applicants more effectively manage their resources by providing them added information they can use to determine if they're ready to enter the verification process. This will keep the process moving forward without unnecessary delays or the termination of their verification application. The proposed clarifications are necessary to streamline and better define the application and review process.

## I. OTHER PROPOSED AMENDMENTS

The remaining proposed amendments are necessary to streamline the application and review process and clarify and update the Procedure. These proposed amendments include:

*Design Modifications.* The Procedure currently specifies that any design modifications to a verified DECS be evaluated under the Procedure. Since a design modification may change the effectiveness or durability of an applicant's DECS, these types of system changes are reviewed and processed in a fashion similar to an initial verification application. Staff's proposal includes clarifying language to support the proposed changes to the application and review process and updates this section to include a list of specific examples that would be viewed as a design change. While not intended to be comprehensive, the list includes major parts, components, materials, catalyst loadings and wash coats, and other application specific criteria that could impact the overall performance and/or durability of a system. These changes are necessary to streamline the application and review process by providing additional guidance to applicants.

*Selection of DECS for Testing and Right of Entry.* The Procedure currently provides the Executive Officer with the authority to request that applicants provide a reasonable number of verified DECS for testing and/or inspection. Staff's proposal updates these requirements by clarifying that this may include DECS in the possession of an authorized dealer or distributor and includes "right-of-entry" provisions for an agent or employee of ARB for the purpose of selecting and securing test units. These changes are necessary to update the Procedure and facilitate confirmatory testing.

*Testing on an Emission Control Group Basis.* The Procedure has always required applicants to perform emissions and durability testing of their DECS on an emission control group basis. An emission control group is a selection of engines and/or vehicles that share similar design and operational characteristics making them individually representative of the entire group. Staff's proposal includes clarifying language to explain this policy more explicitly in the Procedure and identifies attributes which define a distinct emission control group and therefore, should be considered by applicants when selecting an appropriate test engine or durability demonstration vehicle/engine combination. These changes are necessary to streamline the application and review process.

*DECS Sizing During Emissions and Durability Testing.* Staff's proposal clarifies that applicants to the Procedure must appropriately size their DECS for emissions testing and durability demonstrations and includes information regarding multiple filter configurations. Applicants generally provide DECS in multiple sizes to accommodate different engine power ratings. Over or under sizing a DECS can change emissions testing results and is not representative of proper installation practices. Applicants that neglect to address these issues may inadvertently generate test data that cannot be

used to support their verification effort. This may lead to delays in the review of their application and is therefore necessary to streamline the application and review process.

*Durability Testing.* Applicants to the Procedure are required to demonstrate the durability of their DECS during the verification process. Durability demonstrations used to support verifications are almost always carried out in-field, duplicating the real-world conditions that an applicant's DECS will experience once in the hands of the end-user. Staff believes that this type of durability testing yields stresses to an applicant's DECS that are difficult, if not impossible, to re-create in a laboratory environment. However, the Procedure currently includes provisions allowing applicants to request the use of a laboratory-based durability demonstration. To better simulate real-world conditions for extremely demanding environments, staff's proposal clarifies that laboratory-based durability demonstrations are not acceptable as primary durability data for on-road, off-road, and APU applications. Applicants may continue to request, at the Executive Officer's discretion, a laboratory-based demonstration but only as secondary supporting data. These changes will streamline the application and review process by clarifying this requirement for applicants before they submit their applications for review.

*Electronic System Codes.* Staff's proposal includes a clarification that instructs applicants to submit error codes, fault codes, and high backpressure codes generated by their DECS control or operational monitoring system during a durability or field demonstration. If any codes occur during these tests the Procedure requires they be submitted and staff's proposal clarifies this requirement so that staff can determine the magnitude and severity of the potential fault. In the past, some applicants have failed to submit these codes requiring staff to request them which delays the review process. Therefore, these changes update the Procedure and will help streamline the application and review process.

*High Backpressure Notification and Data Monitoring and Storage.* The Procedure currently requires all filter-based DECS be installed with a backpressure monitor as a means of notifying the operator of high backpressure conditions. High backpressure conditions can result in significant damage to the system or the engine. Staff's proposal includes updated language that specifically identifies the minimum requirements that must be met by an applicant's backpressure monitor. These minimum requirements are currently in use by a majority of applicants. These changes are necessary to update the Procedure by clarifying the minimum requirements for all applicants. In addition, staff's proposal requires applicants to submit any software or hardware necessary to download and view the recorded data. This added requirement is necessary to allow staff to monitor in-use systems and ensure that they are functioning properly and adhering to the minimum requirements.

*Determination of Emissions Reductions.* Staff's proposal clarifies the method used by the Executive Officer when categorizing an applicant's DECS to an appropriate Level or Mark. Because the calculations for determining emissions reductions are based on the averages of several replicate test sets, staff's proposal clarifies that each test set submitted with the application must be greater than or equal to the minimum emissions

reduction level that defines the Level or Mark. Furthermore, staff's proposal makes it clear that it is not sufficient for the average reduction from all tests to exceed the minimum value of the Level or Mark if one of the reductions in the average is below the minimum requirements for that Level or Mark. These changes are needed to update the Procedure by clarifying how the Executive Officer calculates an applicant's percent emissions reduction.

*Labeling Requirements.* Staff has clarified the language regarding how DECS labels should be constructed and affixed to make it clear that the labels must remain legible and resist tampering for the duration of a strategy's minimum warranty period. In addition, to address the issue of missing labels, staff has added a provision that requires end-users to notify applicants in the event of a missing or damaged label and specifies that the applicant must issue an ARB approved replacement label within 45 days. This change is proposed to update the Procedure by addressing in-field issues associated with missing system labels.

*Verification of Alternative Diesel Fuels and Fuel Additives.* The Procedure provides for the verification of fuel-based DECS and these are generally categorized as either fuel additives or alternative diesel fuels. Under the Procedure, all fuel-based strategies must undergo a more comprehensive evaluation than other control systems which rely on emissions reductions through the use of hardware alone. For example, all fuel-based strategies must be evaluated through the multimedia process as required by Health and Safety Code Section 43830.8, which includes evaluations from all divisions within the California Environmental Protection Agency. In addition, the Procedure requires that these strategies be in compliance with applicable federal, state, and local government requirements, including registration with U.S. EPA. To assist applicants, staff's proposal updates the testing requirements, addresses an oversight regarding the labeling requirements for these types of strategies, specifies that applicants obtain U.S. EPA registration before submitting their preliminary verification application to ARB, and removes an erroneous provision for conditional verification that is not allowed by the Procedure. These changes are necessary to align the testing requirements for these types of strategies with other sections in the Procedure, provide accurate information to applicants, and update the Procedure. This will streamline the application and review process for these types of strategies. A more complete discussion of the proposed changes can be found in Chapter VII.

*Compliance.* Staff proposes updating the Procedure by clarifying that all ARB verified DECS must be properly installed and maintained and that tampering with an installed ARB verified DECS is not allowed. These changes are necessary to update the Procedure and support staff's other proposed amendments.

*Safety Considerations.* Staff's proposal clarifies the requirements that applicants address safety and the potential for catastrophic failure of their strategy's while in use. The Procedure currently requires applicants to address in their preliminary application any potential safety issues associated with their strategy. Staff's proposal updates the Procedure and clarifies that applicants must provide an analysis of all potential safety

and catastrophic failure issues associated with the use of their DECS including an analysis of all potential failure modes. Staff's proposal also clarifies that the Executive Officer may require additional safety testing by an independent test facility and may require design modifications to a DECS both before and after receiving verification. These updates are necessary to ensure that verified strategies can be safely deployed in-field, to update the application requirements, and to protect end-users.

Applicability. Staff added the term "market-ready" to clarify that the Procedure applies to market-ready in-use strategies and not prototypes. The Procedure is not designed to review the performance of prototype systems, only those strategies that are fully designed and ready to enter the marketplace. In addition, to streamline the application process, staff's proposal provides the Executive Officer with the ability to request an applicant submit a market-ready DECS to support their preliminary application. This will ensure that all applicants are ready to enter into the verification process and will support staff's other proposed amendments designed to streamline the application and review process.

Application Process Overview. Staff's proposal updates the language in the application overview section clarifying the policy that requires applicants to propose a test plan commensurate with their proposed emission control groups. This change is necessary to support staff's proposed amendments.

Submission of Applications, Correspondence, and Reports. Staff's proposal updates the Procedure to remedy an oversight and now directs applications intended for use with stationary or RTG cranes applications to the appropriate ARB Branch. This change is necessary to streamline the application and review process.

Concurrent Submission of Service Bulletins. Staff's proposal updates the Procedure by clarifying that applicants are required to submit any technical service bulletins or other service related information provided to end-users, authorized installers, or distributors concurrently to ARB. This change is necessary to support staff's proposed amendments.

Application Format. Staff's proposal corrects several format and numbering errors in the information outline of section 2702 and adds clarifying language stipulating that applicants must submit the raw, real-time data collected during emissions testing and specifying that applicants are required to submit sample scale drawings of both the original and replacement labels for their DECS with their preliminary application. These changes are necessary to streamline the application and review process.

Verification Transfers. Staff's proposal updates the Procedure by adding language requiring applicants to submit a plan detailing how they will comply with the Procedures in-use compliance requirements when requesting a verification transfer.

Durability Demonstration Periods. Staff's proposal clarifies that the minimum durability demonstration period for locomotive verifications is 3000 hours.

Definitions. Staff's proposal adds definitions for the terms "Days", "Market-ready", "Recall", "Rubber-tired Gantry Crane", "Valid Warranty Claim" and "Warranty Claim", and modifies the definition of the term "baseline". These changes are necessary to support staff's proposed amendments.

Language Correction. Throughout the Procedure staff removed the word "system" where appropriate and replaced it with "strategy", as in "Diesel Emission Control Strategy", for consistency and clarity.

## **CHAPTER III**

### **REGULATORY ALTERNATIVES**

#### **A. INTRODUCTION**

As part of the regulatory development process, staff considered three alternatives to determine whether other approaches could provide flexibility to DECS manufacturers while maintaining the integrity of the Procedure. This section discusses these alternatives and the reasons why staff ultimately determined they are not better than the proposed amendments addressed in detail in Chapter II. 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 as or less burdensome to affected private persons than the proposed regulation.

#### **B. ALTERNATIVE A: DO NOT AMEND THE PROCEDURE**

Failure to adopt the proposed amendments will forgo the economic benefits applicants would realize. Applicants will be required to perform two phases of in-use compliance emissions testing and this process must begin after selling or leasing 50 units in the California market. This would eliminate the increase in the sales triggers and the corresponding reduction in per unit overhead costs and additional time this change provides to applicants to the Procedure. Failure to adopt the proposed amendments would also eliminate the alternative test schedule, fail to adequately address entirely fuel-based strategies, and would not provide any alternatives regarding the need for applicants to use multiple test engines for in-use testing. Applicants would be required to remove and replace each system during the in-use compliance process, including items that may not provide useful information regarding the efficacy or durability of their verified systems. This would eliminate the much needed financial flexibility staff's proposal provides to applicants to the Procedure and would eliminate the streamlining of both the in-use compliance process and the application and review process. Without the recall provisions and warranty changes staff's ability to address potential problems with an applicant's DECS would be limited, resulting in fewer protections to the end-users of these devices. Failure to adopt the changes to the pre-installation compatibility assessments will continue to result in the retrofit of some candidate engines that are in a poor state of maintenance leading to poor performance and dissatisfied end-users. In addition, off-road DECS manufacturers would not be allowed additional time to complete their conditional off-road verifications, several critical parts of the Procedure would not be updated, and issues regarding the safe use and application of these strategies would not be adequately addressed.

### **C. ALTERNATIVE B: ADOPT 500 UNIT SALES TRIGGER**

The U.S. EPA's Voluntary Retrofit Program currently requires in-use testing after the sale of 500 units nationwide. During the public process, applicants to the Procedure requested that staff consider adopting this sales trigger. While staff agrees that the current sales trigger of 50 units is too low both with respect to the cost of the required in-use testing and in regards to how quickly applicants are reaching the trigger after receiving their initial verification, staff does not believe that adopting a 500 unit sales trigger is appropriate. U.S. EPA's retrofit program is administered in all 50 states and ARB's in only one, California. Simply aligning the sales thresholds of both verification programs does not address the vast difference in market sizes that they represent. In the original staff report for the verification program, staff stated that they based the 50 unit sales number on U.S. EPA's Voluntary Retrofit Program (ARB 2002). To be consistent with U.S. EPA's sales trigger of 500 units nationwide, 50 units were originally selected since California possessed approximately 10 percent of the nation's population at that time.

Staff rejected this alternative due to the vast differences in market size of the two programs and because of concerns relating to the availability of an applicant's in-use test data. Allowing a sales trigger this large would delay most applicants in use testing to the point that their initial post-verification sales were well past their minimum warranty period. In-use test data submitted after the expiration of a devices warranty period is not supportive of ARB's verification program and provides limited protections to the end-users of these devices. Staff's proposal significantly increases the sales trigger before in-use emissions testing is required and includes lower cost field testing after the sale of 100 units to identify any performance issues before widespread application of an applicant's verified strategy occurs. Staff's proposal provides the requested economic relief without sacrificing the end-user protections the current in-use compliance provisions provide.

### **D. ALTERNATIVE C: ADOPT MAXIMUM BACKPRESSURE LIMITS**

Staff considered adopting maximum backpressure limits that all applicants to the Procedure would be required to meet for verification. Setting limits that apply to all applicants equally would streamline the verification process and standardize DECS for end-users. However, ARB verifies DECS for a wide variety of vehicles and equipment making the selection of one set of backpressure requirements difficult. Staff worked closely with stakeholders but ultimately rejected adopting one set of backpressure limits for all types of DECS. Staff will continue to investigate the feasibility of requiring a universal backpressure requirement. Staff opted instead to clarify the existing requirements and require applicants to provide the software or hardware necessary to download and view all recorded backpressure data. This will allow staff to monitor the situation and to collect the data necessary to support additional changes if they are determined to be feasible.

# CHAPTER IV

## ENVIRONMENTAL IMPACTS ANALYSIS

### A. INTRODUCTION

Based on ARB's review, staff has determined that implementation of the proposed amendments to the Procedure would not result in a significant effect on the environment. This analysis provides the basis for reaching this conclusion.

### B. ENVIRONMENTAL REVIEW PROCESS

ARB is the lead agency for the proposed regulation and has prepared this environmental analysis pursuant to its certified regulatory program. Public Resources Code §21080.5 of the California Environmental Quality Act (CEQA) allows public agencies with regulatory programs to prepare a plan or other written document in lieu of an environmental impact report or negative declaration once the Secretary of the Natural Resources Agency has certified the regulatory program. ARB's regulatory program was certified by the Secretary of Natural Resources Agency<sup>2</sup>. As required by ARB's certified regulatory program, and the policy and substantive requirements of CEQA, ARB prepares an environmental analysis (EA) to assess the potential for significant long or short-term adverse environmental impacts associated with a proposed action<sup>3</sup>. In accordance with ARB's regulations, the analysis also describes any beneficial environmental impacts<sup>4</sup>. The CEQA Guidelines environmental checklist was used to consider the potential for significant impacts<sup>5</sup>. In accordance with ARB's certified regulatory program, this environmental analysis is included in the Staff Report: ISOR for the rulemaking<sup>6</sup>.

If comments received during the public review period raise significant environmental issues, staff will summarize and respond to the comments in writing. The written responses will be included in the Final Statement of Reasons (FSOR) for the regulation. In accordance with ARB's certified regulatory program, the decision maker will approve the written responses prior to taking final action on any proposal<sup>7</sup>. If the regulation is adopted, a Notice of Decision will be posted on ARB's website and filed with the Secretary of the Natural Resources Agency for public inspection<sup>8</sup>.

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<sup>2</sup> CEQA Guidelines §15251(d); California Code of Regulation (CCR), title 17, section 60005-60008

<sup>3</sup> CCR title 17, section 60005(b)

<sup>4</sup> CCR title 17, section 60005(d)

<sup>5</sup> CEQA Guidelines, Appendix G

<sup>6</sup> CCR title 17, section 60005

<sup>7</sup> CCR title 17, section 60007(a)

<sup>8</sup> CCR title 17, section 60007(b)

### **C. IMPACTS ANALYSIS**

ARB has determined that this proposed action would not have a significant effect on the environment. The proposed amendments to the Procedure consist of minor administrative and procedural changes that will clarify definitions, add recall provisions, and change monitoring, testing, and reporting requirements for applicants who voluntarily participate in DECS verification process.

The proposed amendments do not change the stringency or effectiveness of the verification process or significantly impact the existing evaluation methodology of candidate diesel emission control strategies. The proposed action would simply modify an existing methodology and protocol for evaluating diesel emission control strategies. Because the Verification Procedure is not designed to generate additional emission reductions, but rather to ensure reductions occur as planned, the proposed amendments include multiple clarifications regarding the requirements for verification, a well-defined application and review process, and additional installation pre-assessment and installer requirements. These are proposed to assist applicants in their future verification efforts and to address in-field issues by ensuring that each applicant's verified technology is correctly applied. Again, these changes do not affect the stringency of the verification process but simply modify the existing evaluation protocol and better ensure that expected emissions benefits are realized. Therefore, the proposed amendments will not result in any change in emissions.

Overall, because the proposed amendments will not result in a change in the types, attributes, or number of verified diesel emission control strategies produced, these changes would neither require nor be reasonably expected to elicit a compliance response from a covered entity that could result in a physical change to the environment, directly or indirectly.

## CHAPTER V

### AIR QUALITY AND ENVIRONMENTAL JUSTICE

#### A. AIR QUALITY

The proposed amendments simply modify an existing methodology and protocol used to evaluate diesel emission control strategies. No direct emissions benefits are associated with staff's proposal. Therefore, no cost effectiveness analysis could be performed.

#### B. ENVIRONMENTAL JUSTICE

The objectives of ARB's statewide regulatory programs are better air quality and reduced health risk for all residents throughout California. The Board has a policy that community health and environmental justice concerns be addressed in all of ARB's regulatory programs. This is consistent with ARB's environmental justice policy of reducing exposure to air pollutants and reducing the adverse impacts from toxic air contaminants in all communities, including low-income and minority communities.

State law defines environmental justice as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies (Senate Bill 115, Solis; Statutes of 1999, CH. 690; Government Code section 65040.12 (c)). The Board has established a framework for incorporating environmental justice into ARB's programs consistent with the directives of State law. The policies developed apply to all communities in California, but recognize that environmental justice issues have been raised more in the context of low-income and minority communities, which sometimes experience higher exposures to some pollutants as a result of the cumulative impacts of air pollution from multiple mobile, commercial, industrial, area wide, and other sources. For over 25 years, ARB, local air districts, and federal air pollution control programs have made substantial progress towards improving the air Quality in California. However, some communities continue to experience higher exposures than others as a result of the cumulative impacts of air pollution from multiple mobile and stationary sources and thus suffer a disproportionate level of adverse health effects.

The Diesel RRP is effectively reducing the risk associated with exposure to air pollutants and the adverse impacts from toxic air contaminants in all communities, including low-income and minority communities. The Procedure plays a vital role in supporting the Diesel RRP by ensuring that DECS applied to in-use vehicles achieve real and durable PM and NO<sub>x</sub> emissions reductions. Thus, it is consistent with ARB's environmental justice policy of reducing exposure to air pollutants and reducing the adverse impacts from toxic air contaminants in all communities, including low-income and minority communities.

The proposed amendments do not change the stringency of the Procedure so there is no emissions impact associated with the proposal. However, ARB will continue to evaluate diesel emission control strategies as these technologies improve and will review the Procedure as additional relevant scientific evidence becomes available to make certain that the health of the public is protected.

To ensure that everyone has an opportunity to stay informed and participate fully in the development of the proposal, staff held several public workshops, multiple conference calls and meetings with affected industry, and distributed information through the internet and on ARB's public website, as described in Chapter I of this report.

## CHAPTER VI

### ECONOMIC IMPACT ANALYSIS PREPARED PURSUANT TO GOVERNMENT CODE SEC. 11346.3

#### A. LEGAL REQUIREMENTS

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 is to include any non-discretionary cost or savings to the local agencies and the cost or savings in federal funding to the State.

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.

#### B. ESTIMATED COSTS OF THE PROPOSED AMENDMENTS

The proposed amendments to the Procedure are intended to provide financial flexibility to applicants<sup>9</sup> while maintaining the integrity of the verification program. Staff's proposal reduces the amount of required in-use compliance testing by up to one-half and allows additional sales before this testing is required. The addition of functional in-field tests and the alternative test schedule further reduces the costs associated with the in-use compliance requirements. Streamlining the in-use compliance process and providing additional time for applicants to complete their conditional verifications provides even greater financial flexibility. These proposed changes provide substantial economic relief to applicants, especially in the short term. The addition of recall provisions and clarifications to the warranty reporting requirements are necessary to maintain the stringency of the Procedure and ensure the in-use performance of DECS, but may offset some of the cost savings provided above. Staff has analyzed each proposed amendment to determine potential economic impacts. For more information on the methodology used to calculate the estimated costs and savings of staff's proposal, please see Appendix C.

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<sup>9</sup> DECS manufacturers are referred to as "applicants" in the Procedure and throughout this report.

Overall, the proposed amendments to the Procedure are estimated to save the DECS industry approximately \$2.1 million to \$5.6 million. Below is a description of the potential cost or savings of each of the proposed major amendments to the Procedure.

*In-Use Compliance Requirements.* The proposed amendments to the Procedures in-use compliance requirements would reduce an applicant's in-use testing costs by up to one-half. The addition of functional in-field tests, the alternative test schedule, and streamlining the process provides even greater financial flexibility to all applicants. Staff estimates the overall savings to DECS industry (specifically companies that already have verified DECS) from the proposed changes will be approximately \$5 million to \$5.7 million for currently verified DECS families. For companies pursuing verification for new products, the proposed changes could reduce overall verification costs by 10 percent.

*Recall Provisions.* The proposed recall provisions could potentially increase long-term costs for all applicants and have the potential to create a significant economic impact for any applicant subject to a recall action. The Procedure currently includes provisions that provide for remedial measures in the event of a failure associated with applicant's DECS family, so even without the addition of the proposed recall provisions it is assumed that applicants have made appropriate financial preparations and that such costs are already being incurred. Though the proposed recall provisions do not impose a direct cost to industry, staff estimates that in the event of a recall action the potential economic impact could be up to \$2.8 million for an applicant of a verified on-road system.

*Installation Warranty Reporting.* Staff's proposal requiring authorized installers to submit an annual installation warranty report will result in an additional cost for each installer. Staff estimates that the proposed changes will cost each installer approximately \$960 each year. This represents an annual statewide reporting cost of \$73,000 based on 76 businesses that are currently installing ARB verified retrofit devices.

*Pre-Installation Compatibility Assessment, Installer Requirements, and End-User training.* Staff's proposals requiring applicants to specify additional pre-installation assessment criteria, additional requirements for installers, and end-user training are not expected to result in any significant economic impacts.

*Application and Review Process.* The proposed changes to the application and review process should have no economic impact. Staff's proposal merely defines the application and review process to better define the requirements for verification and the process used by staff in reviewing verification applications.

*Impacts of Other Clarifications.* None of the remaining proposed clarifications to the Procedure are expected to result in any additional costs or savings, because they implement the original intent of the regulation.

### **C. POTENTIAL IMPACT ON BUSINESSES, BUSINESS COMPETITIVENESS, EMPLOYMENT, AND BUSINESS CREATION, ELIMINATION, OR EXPANSION**

*Potential Impact on Businesses.* The proposed amendments to the Procedure's in-use compliance requirements would provide substantial reduce the cost to applicants by reducing the amount of required in-use compliance testing, providing multiple testing options, allowing additional unit sales before this testing is required, providing in-field functional testing, and streamlining the process. The proposed changes will reduce the costs associated with the in-use compliance requirements and are expected to provide a savings to industry of approximately \$5 million to \$5.7 million for the currently verified DECS families, and reduce the overall costs of future verifications by 10 percent.

The proposed recall provisions could potentially create a significant economic impact for any applicant subject to a recall action. However, the Procedure currently includes less direct provisions that provide for remedial measures in the event of a failure of an applicant's DECS family, so even without the addition of the proposed recall provisions it is assumed that applicants have made appropriate financial preparations and that such costs are already being incurred. Should a recall event occur applicants may see their savings from the proposed changes to the in-use compliance requirements eliminated. Staff estimates the potential economic impact of a recall action could be up to \$2.8 million. However, applicants that produce a robust system are unlikely to be subject to a recall and would realize the economic benefits from the reduction in the amount of in-use testing.

The proposed amendment requiring the submission of an annual installation warranty report will cost each installer approximately \$960 each year. However, the benefit of receiving these reports outweighs the relatively low cost of the reporting. The estimated annual statewide reporting cost is \$73,000 based on 76 businesses that are currently installing ARB verified DECS.

The remaining amendments represent procedural changes and clarifications and should not result in any significant impacts on businesses. Overall, the proposed amendments are expected to provide a savings to the DECS industry of approximately \$2.1 million to \$5.6 million.

*Potential Impact on Business Competitiveness.* The requirements for verification under the Procedure apply to any business that elects to participate in the program regardless of its location. Staff's proposal does nothing to alter the applicability of the program, and does not hold California business to a different standard than non-California business. Manufacturers that participate in the verification program need to provide detailed information and data on their products in accordance with the Procedure. The proposed amendments do not change the voluntary nature of the Procedure or its applicability to all businesses that manufacture or market diesel emission control technologies regardless of their location. As previously stated, installers of verified products will incur an additional reporting expense of \$960 per year.

Potential Impact on Employment. The proposed amendments to the Procedure are not expected to cause a noticeable change in California employment and payroll. Staff does not believe the regulatory proposal would result in the loss of jobs. As previously noted, participation in the program is voluntary. If and when the recall provisions are used is unknown, so there is no assurance that an increase in the demand for repairs will materialize. Even if a recall occurs, most repair businesses are expected to handle the additional work with their existing employees.

Potential Impact of Business Creation, Elimination or Expansion. The proposed amendments to the Procedure will not impact the status of California business in a noticeably different way from the current version of the Procedure. The proposed amendments could potentially affect small businesses, especially installers of verified devices. Installers who choose to install these verified devices would incur costs due to increased reporting requirements but these costs are not expected to be significant. Overall, staff expects that the proposed amendments to the Procedure will have no significant adverse impact the status of California businesses, including small businesses.

#### **D. Potential Impact to California State or Local Agencies**

Staff does not expect the proposed amendments to the Procedure to have a fiscal impact on any local or State agency except ARB to monitor warranty reports, investigate potential warranty claims, and develop and maintain a warranty tracking database in fiscal year 2013/2014 and thereafter. One additional staff will be needed to effectively implement the proposed amendments. The total annual staff costs are estimated to be \$187,000 (including \$175,000 for staff costs and \$12,000 for travel expenses).

## CHAPTER VII

### SUMMARY OF PROPOSED REGULATORY CHANGES

#### A. SUMMARY OF PROPOSED REGULATORY CHANGES

This section provides an explanation or rationale for each proposed change included in the proposed regulation order in Appendix A. to the *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines* (the Procedure).

##### **Amendments to Title 13, CCR, Section 2700. Applicability.**

Modifications to this section include the addition of the term “market-ready” to clearly identify that the Procedure is intended to apply to market-ready DECS that are fully designed, developed, and ready for introduction into commerce.

##### **Amendments to Title 13, CCR, Section 2701. Definitions.**

Changes to this section include modifications to definitions to update the Procedure and the addition of terms needed to support the proposed amendments.

##### ***The following definitions are being modified:***

(9) The definition of “Baseline” is being modified to clarify that the term refers to an engine or test vehicle in its original equipment manufacturers configuration. Modified or altered engines or test vehicles cannot reasonably be expected to produce baseline emissions test results.

(29) The definition of “Installer” is being modified for updating numbering and to include the additional designation of “Authorized Installer” to support staff’s proposed amendment that requires applicants to authorize the installers of their verified DECS.

The following definitions are being modified for minor edits and updated numbering:

(14) “Diesel Emission Control Strategy”,  
(15) “Diesel Emission Control Strategy Family Name”, (16) “Diesel Engine”,  
(17) “Diesel-Fueled Auxiliary Power System”, (18) “Distributor”,  
(19) “Donor Vehicle/Engine”, (20) “Durability”, (21) “Emergency Standby Engine”,  
(22) “Emergency Use”, (23) “Emission Control Group”, (24) “End User”,  
(25) “Executive Officer”, (26) “Executive Order”, (27) “Fuel Additive”, (28) “Hot Start”,  
(30) “Locomotive”, (31) “Marine Engine”, (33) “Portable Engine”, (36) “Re-designation”,  
(37) “Regeneration”, (38) “Repower”, (39) “Revoke”, (41) “Seller”,

(42) “Stationary Engine”, (43) “Transport Refrigeration Unit”,  
(44) “Unidirectional Device Design and Installation”, (45) “Used Verified Device”,  
(47) “Verification”, (49) “Warrantable Condition”

***The following definitions are being added:***

(13) The definition of “Days” is being added to clarify that the various submission time limits are determined based on normal working days of ARB.

(32) The definition of “Market-Ready” is being added and is used to define a diesel emission control strategy that is ready for application to the Procedure.

(34) The definition of “Quarterly Reports” is being added to support the reporting requirements of the proposed recall provisions.

(35) The regulation has changed and now provides ARB’s Executive Officer with recall authority to remedy the systemic failure of an applicant’s verified strategy, or to address issues of safety or the potential for catastrophic failure. Therefore, a definition of “Recall” is being added to the regulation.

(40) The Procedure can be used to verify a diesel emission control strategy intended for use with a rubber-tired gantry crane, therefore, a definition of “Rubber-Tired Gantry Crane” is being added to the regulation.

(46) Applicants to the Procedure are required to submit annual warranty reports once their products are verified, and may need to submit supplemental reports if valid warranty claims exceed a 4 percent threshold. Therefore, a definition of “Valid Warranty Claim” is being added to the regulation. Also, the definition is needed to clarify how applicants are to determine if the 4 percent threshold has been exceeded.

(48) Applicants are required to address all warranty claims in their annual reports, but must take specific actions if valid warranty claims exceed 4 percent. Therefore, a definition of “Warranty Claim” has been added to the regulation to clarify the difference between the 2 types of warranty claims.

**Amendments to Title 13, CCR, Section 2702. Application Process.**

This section identifies the requirements necessary for application to the Procedure, the application review process, the verification Levels or Marks that may be assigned to an applicant’s DECS family by the Executive Officer, the requirements for extending an existing verification, modifying the design of a verification, verification transfers, requirements for pre-existing data from other verification programs, addresses the treatment of confidential information, identifies ARB testing and inspection requirements for verified products including right of entry provisions, and the procedures including

penalties that may be assessed by the Executive Officer for violating the requirements of the application process.

(a) Overview. The modifications to this section include minor edits and clarify that applicants seeking to verify their product for more than one emissions control group must address this in their proposed test plan by including test engines and testing conditions that are representative of the least favorable conditions.

(b) Preliminary Verification Application. The modifications to this section are for minor edits and to provide the Executive Officer with the authority to request a market-ready DECS along with an applicant's preliminary verification application. The Procedure is not intended to address prototypes or concepts and unless an applicant is ready to enter the market place with their DECS at the time of application they cannot provide the detailed information necessary to successfully navigate the verification process. Previously ARB staff has received preliminary applications that were based on prototype systems that needed further research and development to become fully verified. Because the information needed to finish the application is not complete, the application is delayed and in some cases never completed. ARB staff processes applications in the order received so if the DECS is not market-ready, the application process will take longer to process and may hold up the verification process for other DECS manufacturers that have already submitted applications with market-ready systems. This amendment will allow ARB staff to process the application as well as help to expedite the verification process. This new requirement is necessary to address any DECS that may not be ready to complete the Procedure. Any DECS submitted will be returned to the applicant, at the applicant's expense, when verification is granted, denied, or withdrawn.

(b)(5)(c) This subsection was updated to correct the section reference.

(c) The modifications to this section are for minor edits and to remedy an oversight regarding the identification of the appropriate ARB Branch to which specific types of applications should be directed. The changes identify the appropriate ARB Branch for submitting locomotive, stationary, and rubber-tired gantry cranes applications.

(d) Application Format. This section includes a detailed outline of required information that applicants to the Procedure should use to develop their preliminary and final verification applications. The changes to this section include minor edits, elimination of duplicative information, and additional language necessary to update the Procedure. These include:

2.7 Additional clarifying language that the previously required safety discussion has been revised to include an analysis of all potential safety and catastrophic failure issues as identified in section 2706(w).

2.10.2 A new subsection requiring applicants to provide objective criteria in their applications for determining if a DECS has been properly cleaned.

3.1, 3.2, 3.3, 3.4, 3.5, and 3.5.1 These subsections were updated to correct the numbering sequence.

6.3 This subsection was updated to correct the section reference.

8.A. Replacing “laboratory” with “emissions” to clarify the appropriate test report.

8.A.1 Clarification that applicants must submit the raw, real-time data gathered by the emissions test facility for submission with their application.

8.C. Removal of this duplicative requirement.

8.E. Clarification that applicants are required to submit sample scale drawings of both their original and replacement DECS labels with their application.

(e) Preliminary Verification Application Review Process. Several new subsections have been added to clarify and provide specificity to the application and review process currently used by staff to evaluate an applicant’s DECS to ensure that it meets the requirements of the Procedure.

(e)(1) Review for Completeness. The Executive Officer will notify applicant if preliminary application is complete within 30 days of receipt. If application is deemed incomplete, applicant will have three opportunities to submit missing information/data or application will be considered terminated.

(e)(2) Engineering and Compliance Review. After determining that the preliminary application is complete, the Executive Officer will conduct a technical review and determine if the application is adequate to support the development of a test plan. If deemed inadequate, the Executive Officer will request additional information. Applicant will have three opportunities to submit additional information/data or the application will be considered terminated.

(e)(3) Test Plan Approval Letter. Following the Engineering and Compliance review and determination that the application is adequate and satisfactory, the Executive Officer will issue a test plan approval letter within 45 days.

(e)(4) This new subsection provides instructions on what must be done if application is terminated and applicant wishes to attempt verification again. The applicant must wait 30 calendar days before submitting a new, revised preliminary application.

(f) Final Application Review Process. The changes to this section provide an expanded explanation of the final application review process. Four subsections were added as follows:

(f)(1) This subsection clarifies that a final application may not be reviewed by the Executive Officer unless a test plan approval letter has been issued to the applicant.

(f)(2) Review for Completeness. This subsection clarifies that the Executive Officer will review final application for completeness and applicant will have three opportunities to complete the application in the event information is missing.

(f)(3) Test Results and Compliance Review. This subsection clarifies that once the application is considered complete the Executive Officer will have 60 days to determine if the diesel emission control strategy merits verification and will classify it per the emission reduction levels of Table 1 as shown in this subsection.

(f)(4) This new subsection provides instructions on what must be done if the final application is terminated and the applicant wishes to attempt verification again. The applicant must wait 30 calendar days before submitting a new, revised final application.

(g) Application Termination. This new section provides language to clarify that in the event the Executive Officer terminates an application at any point in the application review process, the applicant must wait a minimum of 30 days to submit a new, revised application that addresses the deficiencies that caused the original termination.

(h) and (i) These sections were updated to correct the numbering sequence and section references.

(j) Design Modifications. This section was updated to correct the numbering sequence and new language was added to inform applicants that if the design of their DECS is modified at any point in the review process, the application will be considered terminated. Applicants may resubmit by following the requirements of sections 2702(g). Clarifying language was also added to provide examples of what is considered a design modification.

(k) Verification Transfers. This section was updated to correct the numbering sequence and a new subsection was added requiring applicants to submit In-Use Compliance plans per requirements of Section 2709 when requesting a verification transfer.

(l) and (m) These sections were updated to correct the numbering sequence.

(n) Recordkeeping Requirements. This section was updated to correct numbering sequences, section references, and to clarify that installers of DECS are now referred to as authorized installers. This last clarification is necessary to support the proposed requirement that applicants must train and authorize any person or company that installs their DECS.

(o) and (p) These sections were updated to correct the numbering sequence.

(q) This section was updated to correct the numbering sequence and new language added to clarify that the Executive Officer may request, for the purposes of inspection or

testing, uninstalled DECS that are in the possession of an applicant's authorized dealer or distributor.

(r) This new section clarifies that ARB has the right of entry for the purposes of selecting new DECS for inspection or testing. The proposed changes are necessary to allow ARB staff, upon proper notice and presentation of credentials, the right to enter any facility for the identification and selection of DECS verified under the Procedure for testing and/or inspection.

(s) This section was updated to correct the numbering sequence and clarifying language added to include "recall plan" as one of the documents for which the Executive Officer may revoke or lower the verification level in the event that there are errors, omissions, inaccurate information, fraudulent or deficient submittals. This change is necessary to support the proposed recall provisions. An additional clarification also stipulates that any changes to the DECS that are not authorized by ARB will subject the applicant to enforcement action. This last change is necessary to support the proposed clarifications to section (j) Design Modifications.

### **Amendments to Title 13, CCR, 2703. Emission Testing Requirements.**

The Procedure currently requires applicants to test their DECS to determine its emissions reduction capabilities on an emission control group basis. This section identifies the emissions testing requirements and test procedures that applicants must follow to verify the emissions reductions capabilities of their DECS. The proposed changes include clarifying language which define distinct emission control groups, provide guidance on test engine selection, and DECS sizing.

#### **(a) Testing on an Emission Control Group Basis**

(a)(1) This subsection was updated to correct the numbering sequence.

(a)(2) This new subsection was added to inform applicants that, when requesting verification for more than one emission control group, they must propose a test plan that includes one or more test engines that are representative of the least favorable conditions within the requested emission control group.

(a)(3) This new subsection was added to assist applicants in the selection of an emissions test engine. The proposed language clarifies the attributes of the emission control group that should be considered when selecting a representative emissions test engine. The proposed changes are necessary to provide guidance to applicants in the selection of an appropriate test engine.

#### **(b) Test Engine Requirements and Pre-Conditioning.**

(b)(1) This new subsection adds clarifying language stipulating that if an applicant's DECS has the potential to form NO<sub>2</sub> or other secondary emissions they must identify

this in their application and requires them to provide information showing that their proposed emissions test engine is representative in regards to this potential.

(b)(2) This subsection was updated to correct the numbering sequence.

(c) Diesel Emission Control Strategy Requirements and Pre-conditioning. The term “Requirements and” was added to the name of this section to address the addition of new clarifying language designed to assist applicants.

(c)(1) This new subsection adds clarifying language instructing applicants to appropriately size the diesel emission control strategy in relation to the emissions test engine and stipulates that this must be based on DECS sizing information contained in their application. Applicants should not violate their DECS sizing criteria during emissions testing as this may alter test results. This new language also clarifies that if the sizing criteria is changed either after receiving a test plan approval or during the application review process, the application must be re-evaluated and a new test plan approved. Additionally, the proposed language advises applicants that any testing done prior to the sizing criteria approval may result in the rejection of test data.

(c)(2) This new subsection clarifies that if an applicant’s DECS includes single and multiple filter designs, both designs must undergo full emissions and durability testing. Additionally, this language clarifies the conditions under which single and multiple filter configurations will not require separate emission and durability testing.

(c)(3) This subsection was updated to correct the numbering sequence.

### **Amendments to Title 13, CCR, Section 2704. Durability Testing Requirements.**

The Procedure currently requires applicants to demonstrate the durability of their DECS through an actual field or laboratory based demonstration. This section identifies the durability demonstration requirements and the requirements for conditional verification. The proposed changes include clarifying language which define distinct emission control groups, provide guidance on durability engine selection, DECS sizing, and propose allowing additional time to complete off-road conditional verifications.

(a)(1) This new subsection clarifies that laboratory-based durability demonstrations are not acceptable as the primary durability data used to support verification for a DECS for on-road, off-road, or APU applications. This clarification is necessary as laboratory-based demonstrations are generally insufficient at recreating the conditions that an applicant’s DECS experiences during normal use in these applications. However, applicant’s may request that the Executive Officer consider a laboratory-based durability demonstration as secondary supporting data.

(a)(2) and (a)(3) These subsections were updated to correct the numbering sequences.

(b)(1) This new subsection was added to inform applicants that, when requesting verification for more than one emission control group, they must propose a test plan that includes one or more durability test engines and applications that are representative of the least favorable conditions within the requested emission control group.

(b)(2) This new subsection was added to assist applicants in the selection of a durability test engine. The proposed language clarifies the attributes of the emission control group that should be considered when selecting a representative durability test engine and application. The proposed changes are necessary to provide guidance to applicants in the selection of an appropriate durability test engine and application

(c) Engine Selection and Sizing. This section was updated to correct the numbering sequence and the term “and Sizing” was added to the name of this section to address the addition of new clarifying language designed to assist applicants.

(c)(1) This subsection was modified to correct the numbering sequence and clarifying language has been added stipulating that applicants must identify the durability test engine, vehicle, and application. The proposed changes are designed to assist applicants by providing additional guidance in the development of their verification applications.

(c)(2) and (c)(3) These subsections were updated to correct the numbering sequence.

(c)(4) This new subsection adds clarifying language instructing applicants to appropriately size the diesel emission control strategy in relation to the durability test engine and stipulates that this must be based on DECS sizing information contained in their application. Applicants should not violate their DECS sizing criteria during durability testing as this may alter test results. This new language also clarifies that if the sizing criteria is changed either after receiving a test plan approval or during the application review process, the application must be re-evaluated and a new test plan approved. Additionally, the proposed language advises applicants that any testing done prior to the sizing criteria approval may result in the rejection of test data

(c)(5) This new subsection clarifies that if an applicant’s DECS includes single and multiple filter designs, both designs must undergo full emissions and durability testing. Additionally, this language clarifies the conditions under which single and multiple filter configurations will not require separate emission and durability testing.

(d) Test Fuel. This section was updated to correct the numbering sequence.

(e) Service Accumulation. This section was updated to correct the numbering sequence and to identify the appropriate minimum durability demonstration period for locomotives.

(e)(2) This subsection was updated to clarify the temperature and backpressure data submission requirements. Applicants are required to submit the collected data electronically in a spreadsheet and clarifying language was added instructing applicants

that failure to submit the data in an approved format will terminate the application process.

(e)(4) This new subsection clarifies that error codes, fault codes, and high backpressure codes that are generated by a diesel emission control strategy's electronic control system and/or operational monitoring system during the durability demonstration are to be submitted with the date and time each code occurs so that staff may validate that that system was durable and safe throughout the demonstration period.

(e)(5), (e)(6), and (e)(7) These subsections were updated to correct the numbering sequence.

(f) Third-Party Statement for In-field Durability Demonstrations. This section was updated to correct the numbering sequence.

(g) Test Cycle. This section was updated to correct the numbering sequence.

(h) Test Run. This section was updated to correct the numbering sequence.

(i) Maintenance During Durability Demonstration. This section was updated to correct the numbering sequence.

(j) Functional Testing of Monitoring and Notifications. This section was updated to correct the numbering sequence.

(k) Performance Requirements. This section was updated to correct the numbering sequence.

(l) Conditional Verification for Off-road and Stationary Applications. This section was modified to clarify the application categories, to extend the time allotted to complete a conditional verification for off-road applications from one year to two years, and to clarify that conditional verifications are not applicable to strategies that include the use of alternative diesel fuels or fuel additives.

(m) Failure During the Durability Demonstration Period. This section was updated to correct the numbering sequence.

### **Amendments to Title 13, CCR, Section 2705. Field Demonstration Requirements.**

The Procedure currently requires applicants to demonstrate the compatibility of their DECS through an actual field demonstration. If an applicant performs an in-field durability demonstration it may be used to satisfy this requirement. This section identifies the field demonstration requirements. The proposed changes include clarifying language for submitting data collected during field demonstrations.

(c)(1) Temperature and Backpressure Measurement Requirements. This subsection was updated to clarify the temperature and backpressure data submission requirements. Applicants are required to submit the collected data electronically in a spreadsheet and clarifying language was added instructing applicants that failure to submit the data in an approved format will terminate the application process.

(c)(3) Electronic System Codes. This new subsection clarifies that error codes, fault codes, and high backpressure codes that are generated by a DECS electronic control system and/or operational monitoring system during the field demonstration are to be submitted with the date and time each code occurs so that staff may validate that that system was durable and safe throughout the demonstration period.

(c)(4) This subsection was updated to correct the numbering sequence.

(c)(5) This subsection was updated to correct the numbering sequence.

### **Amendments to Title 13, CCR, Section 2706. Other Requirements.**

The Procedure currently has additional requirements such as an NO<sub>2</sub> allowance, limits on other pollutants, test procedures for fuel additives and selective catalytic reduction (SCR) strategies, data monitoring and labeling requirements, and additional requirements for both applicants and installers of verified DECS. This section identifies these additional requirements. The proposed changes to this section include verification process clarifications and several proposed amendments related to high backpressure notification and data monitoring and storage, pre-installation compatibility assessments, system labeling clarifications, additional requirements for installers, training requirements, and safety considerations.

(a)(4)(A)(3) This subsection was updated to correct the numbering sequence and to clarify that the date and time must also be recorded for all backpressure and temperature measurements.

(a)(4)(A)(4) This subsection was updated to correct the numbering sequence.

(a)(4)(C) In-use compliance testing. This section was modified by removing the reference to the first phase of in-use compliance testing. This modification is required to align this section with the proposed changes to the in-use compliance requirements. In-use tests are no longer referred to as phase 1 and 2, but are now referred to as “field” and “emissions” tests.

(b)(1)(A) Limits on Other Pollutants. This section has been modified to add a reasonable emission measurement tolerance level when measuring Non-Methane Hydrocarbon (NMHC) emissions. This is necessary because the current requirement of ten percent over baseline emissions levels for very low emissions engines may be not quantifiable with current laboratory procedures. This change provides a measurable allowance for test engines with near-zero NMHC levels.

(c) Fuel Additives. This section was modified to correct a typographical error.

(c)(5) This subsection has been modified to require applicants of DECS that use fuel additives to obtain U.S. EPA registration prior to submitting an application for verification. Reviewing an applicant's verification application that is concurrently seeking U.S. EPA registration can lead to delays in the verification process. This proposed change will streamline the verification process for all applicants.

(d) Alternative Diesel Fuels. This section has been modified to require applicants of DECS that use alternative diesel fuels to obtain U.S. EPA registration prior to submitting an application for verification. Reviewing an applicant's verification application that is concurrently seeking U.S. EPA registration can lead to delays in the verification process. This proposed change will streamline the verification process for all applicants.

(f)(3) The proposed modifications to this subsection are to clarify that an applicant's backpressure monitor must include, at a minimum, two distinct notification levels or "stages"; the first as the high backpressure limit is approached and the second, when it is reached or exceeded and that the second or final notification must be non-resettable by the end-user. This non-resettable condition is referred to as "latching". The proposed changes clarify that the latching feature, once triggered, must remain on if the vehicle or engine is turned off or loses power, and must immediately resume when the system or vehicle becomes operational. This will ensure that end-users of these systems can take appropriate action and avoid potential damage to their vehicles or equipment. The proposed changes also clarify that these requirements apply to any DECS that includes a DPF or other such device that can increase backpressure over time, such as a DPF used in combination with SCR. This subsection also clarifies that vehicles or equipment operated from multiple locations must include a secondary notification system on the vehicle or equipment to alert the operator of a high back pressure condition.

(f)(3)(A)(1) Clarifies that the final high backpressure must be non-resettable.

(f)(3)(A)(2) Clarifies that if the notification is triggered and the engine is then turned off, then it must resume when the engine is turned back on.

(f)(3)(A)(3) Clarifies that if the notification is triggered and the system loses power or becomes non-functional that the notification must resume when the system resumes operation. This change is necessary to ensure continuity of operation for all systems.

(f)(5) Clarifies that this subsection applies to all systems with backpressure monitors and removes the previous limitation that only specified this requirement for strategies that included an exhaust temperature requirement. The broader application is necessary to clarify the requirements and ensure that all end-users of these devices are informed of potential high backpressure conditions.

(f)(5)(B) This subsection provides clarifications that these systems record date and time for exhaust backpressure and exhaust gas temperature. Clarifications include specifying that the 200 hour recording capacity must include the date and time of measurement, and clarify that each record must consist of the instantaneous measurement or an average of no more than 30 seconds, provided the maximum and minimum values are also recorded for the same averaging period. The proposed changes are necessary to identify minimum requirements for all systems.

(f)(5)(C) This subsection clarifies that system error codes must also include high backpressure codes and each record must include the code and date and time it occurred. While most applicants are already using systems that meet these requirements, this clarification is necessary to identify minimum requirements for these systems that are clear and concise for all applicants.

(f)(6) This new subsection includes requirements that all applicants make available to the Executive Officer upon submission of an application for verification any software or hardware necessary to download and view all recorded data from their monitoring systems. In addition, this subsection requires currently verified DECS to submit any such software or hardware to the Executive Officer within six months following the effective date of these proposed amendments. These new requirements are needed to allow staff to monitor in-use systems and ensure that they are functioning properly and are adhering to the requirements of the Procedure.

(i)(2)(g) This subsection was updated to correct the section reference number.

(j)(1) System Labeling. This section has been modified to clarify that DECS labels must be constructed and affixed so they remain legible and resist tampering for the duration of each strategy's minimum warranty period. In addition, to address the issue of missing labels, a provision was added that requires end-users to notify applicants in the event of a missing or damaged label and specifies that the applicant must issue an ARB approved replacement label within 45 days. This last clarification is designed to address several in-field issues recently identified by staff regarding vehicles and equipment with missing labels.

(j)(2) This subsection was modified to correct typographical errors.

(l) Owner's Manual. This section has been modified to clarify minimum requirements that each applicants owner's manual must adhere to. The proposed changes are necessary to ensure that end-users receive the information necessary to safely operate and maintain their DECS. The proposed changes are as follows:

(l)(1) Table of Contents must be located at the beginning of the owner's manual and identifies the location of the subsection (2) through (18).

(l)(2) This clarifies that the manual must contain a statement alerting the end-user of their responsibility to maintain the candidate engine so that it continues to meet the pre-installation compatibility assessment conditions identified in section 2706(t).

(l)(3) This subsection was updated to correct the numbering sequence.

(l)(4) This subsection was updated to correct the numbering sequence.

(l)(5) This new subsection clarifies that applicants must provide criteria that can be used by end-users to determine if their DECS has been properly cleaned.

(l)(6), (l)(7), (l)(8), (l)(9), (l)(10), (l)(11), (l)(12), (l)(13), (l)(14), (l)(15), (l)(16), (l)(17), and (l)(18) These subsections were updated to correct the numbering sequence.

(n) Installation Manual. This section was modified to clarify that the installation manual needs to provide sufficient detail to enable the installer to properly install DECS. The proposed change is necessary to support the proposed clarifications to the installation warranty requirements.

(n)(1) This new subsection requires applicants to provide the criteria in their installation manual that they will use to authorize a person or company to install their verified device. The proposed change is necessary to support the proposed installer requirements.

(n)(2) This new subsection requires applicants to provide the criteria in their installation manual that they will use to revoke a person or company's authorization to install their verified device. The proposed change is necessary to support the proposed installer requirements.

(t) Pre-Installation Compatibility Assessment. This section describes the pre-installation compatibility assessment requirements required under the regulation that are used to demonstrate that the candidate engine being considered for retrofit is compatible with the verified DECS and meets conditions of the Executive Order prior to installation. The Procedure currently includes these assessment procedures in part to help ensure that candidate engines are properly screened prior to retrofit which results in fewer problems in the field. Modifications to this section are being proposed because even with these basic assessment procedures, in-field problems are still being reported by fleets and individuals. These reports indicate that candidate engines were retrofit even though they were likely in a very poor state of maintenance. To address this, the proposed amendments add additional requirements to the pre-installation compatibility assessment procedures to better ascertain the "health" of the candidate engine prior to retrofit.

(t) The modifications to this section include the identification of "authorized" installers to align with the proposed installer requirements. Also, new language is being proposed to clarify that the pre-installation compatibility assessment must ensure that the candidate

engine meets all the terms and conditions of the Executive Order prior to DECS installation.

(t)(1) This new subsection requires all applicants to establish specific criteria to determine the suitability of the candidate engine prior to retrofit and provide this information to their installers. One such criterion must include a smoke opacity limit, as determined by the Society of Automotive Engineers J1667 test procedures, which can be used by DECS installers to determine if the candidate engine is in a proper state of maintenance. These changes are necessary to validate the condition of the candidate engine prior to installation.

(t)(1)(A) This new subsection specifies that applicants must establish specific criteria such as oil consumption limits, fuel inspection requirements, visual inspections, and other criteria they deem necessary to ensure that the candidate engine is appropriate for use with their verified DECS. Along with the smoke opacity limit, this will allow installers to validate the condition of the candidate engine prior to installation.

(t)(1)(B) The purpose of this new subsection is to require that all applicants select a smoke opacity limit they determine is best suited for use as a screening tool to ensure that their DECS is not installed on an engine in a poor state of maintenance.

(t)(1)(C) This new subsection requires applicants of currently verified DECS to propose a pre-assessment smoke opacity limit for their devices no later than six months following the effective date of the proposed changes.

(t)(1)(D) This new subsection requires applicants with DECS designed for engines and equipment that are unable to perform SAE J1667 smoke opacity test procedures to propose an alternate criterion to be used in its place.

(t)(2) This subsection was updated to correct the numbering sequence and to clarify that the exhaust gas temperature measurements used to determine if the temperature requirements specified by the Executive Order are satisfied must be based on the most challenging pattern of use of the engine. Also, this subsection has been clarified by identifying the applicant as the sole entity that may elect to assess a representative number of candidate engines from a fleet rather than each similar engine. These proposed changes are necessary to ensure that each installation of a DECS with a temperature requirement is done properly to eliminate performance issues.

(t)(2)(C) The modifications to this subsection include the identification of “authorized” installers to align with the proposed installer requirements and a clarification that specifies that the required written statement to the end-user must be provided to the same at the time of installation. Previously this requirement specified a time frame of no later than the date of installation. This results in pre-assessments being performed well in advance of the DECS installation. This has led to in-field problems from engine conditions that have deteriorated before the DECS installation occurred.

(t)(2)(C)(9) The modifications to this subsection include the identification of “authorized” installer to align with the proposed installer requirements and other minor proposed changes to align with the other proposed changes.

(t)(2)(C)(10) This new subsection was added to include the requirement that the applicant or authorized installer provide a written statement to end-use that any change in the pattern of use of the candidate engine that was assessed to determine if it meets the temperature requirements may cause the DECS to fail to meet the temperature requirements and how such a change may affect the performance of DECS.

(t)(2)(E), (t)(2)(E)(1), (t)(2)(E)(2), and (t)(2)(E)(3) These subsections were updated to correct the numbering sequence.

(t)(2)(E)(4) This subsection was updated to correct the numbering sequence. Additional modifications include an allowance to provide flexibility for permitted emergency standby engines with restricted use requirements to propose a period of less than 24 hours for measuring and recording the exhaust gas temperature. The regulation requires exhaust gas temperature of the candidate engine to be measured for at least 24 hours. This proposed change is necessary to ensure that emergency standby engines with restricted use requirements are provided with retrofit as a potential compliance option.

(t)(2)(E)(5), (t)(2)(E)(6), and (t)(2)(E)(7) These subsections were updated to correct the numbering sequence.

(t)(3) Modifications to this subsection include the clarification that additional compatible formats may be used to electronically submit all logged data such as Microsoft Access and an additional change in the language to clarify that the party conducting the pre-installation compatibility assessment may not necessarily be the installer.

(t)(4) This subsection was modified to correctly identify that the pre-assessment may be performed by the applicant or their authorized installer, that the pre-assessment must include the added criteria of 2706(t)1, and that the assessment must occur no more than 15 days prior to retrofit. These changes are necessary to implement the added pre-assessment criteria and to ensure that these assessments are done such that they are still valid at the time of installation. However, this time frame only applies to the assessment performed to determine the state of maintenance of the candidate engine and not the suitability of the exhaust gas temperature profile.

(u) Requirements for Installers of Diesel Emissions Control Strategies. This new section specifies additional requirements for any party that install a verified DECS. The proposed changes require that applicants authorize the installers of their DECS, specifies that installers strictly adhere to all installation requirements of the party that holds the verification, including all pre-assessment criteria, and that they provide the required installation warranty. Also, the proposed modifications specify that no DECS may be installed over any occupied space, fuel tanks, or any other location deemed

unacceptable by the party that holds the verification. These changes are necessary to ensure that any verified strategy is installed properly and safely and will help eliminate in-field issues.

(u)(1) This new subsection requires any party that installs a DECS be authorized and trained by the party that holds the verification.

(u)(2) This new subsection requires any party that installs a DECS comply with the pre-installation requirements.

(u)(3) This new subsection clarifies that any party that installs a DECS must strictly follow all applicable requirements of the party that holds the verification for proper installation.

(u)(4) This new subsection clarifies that any party that installs a DECS must offer an installation warranty.

(v) Training Requirements. This new section clarifies that the applicant must develop and maintain an ongoing training program, specifies minimum requirements for this training, and stipulates that end-users receive this training before the vehicle or equipment is put back into service following installation. The proposed changes are necessary to ensure that the end-users receive adequate training so they can safely operate and maintain their DECS.

(w) Safety Considerations. This new section adds clarifying language to address safety and the potential for catastrophic failure of an applicant's strategy while in use. Applicants have always been required to address any potential safety issues associated with their strategy. The Procedure already requires applicants to include a complete discussion of any potential safety issues in their preliminary application. The proposed amendments clarify that applicants must provide an analysis of all potential safety and catastrophic failure issues associated with the use of their DECS including an analysis of all potential failure modes and that the Executive Officer may require additional safety testing by an independent test facility and may require design modifications to a DECS both before and after receiving verification. The proposed changes are necessary to ensure the safe operation and maintenance of verified strategies.

(w)(1) This new subsection clarifies that the applicant must provide an analysis of all potential safety and catastrophic failure issues associated with the use of their DECS.

(w)(2) This new subsection clarifies that the Executive Officer may require additional safety testing both before and after verification of the DECS.

(w)(3) This new subsection stipulates that if the Executive Officer determines that the applicant has not made a satisfactory demonstration of safety of their DECS, the Executive officer may deny the applicant's request for verification or revoke an existing verification.

(x) Technical service bulletins. This new subsection clarifies that technical service bulletins or other service related information must be submitted concurrently to ARB along with each applicant's end-users, authorized installer or distributors. The proposed change is necessary to ensure that staff has the necessary information to assist applicants and conduct in-field investigations.

### **Amendments to Title 13, CCR, Section 2707. Warranty Requirements.**

Verified applicants and installers of verified DECS are required to provide warranty protections to the end-users of these devices. This section clarifies the warranty requirements for both applicants and installers of verified DECS.

(a)(2)(B) This subsection has been updated to clarify that the requirements only pertain to the installation warranty.

(a)(2)(C) This subsection has been updated to clarify that the requirements only pertain to the installation warranty.

(b)(1) Product Warranty Statement. Clarifying language was added to specify that the manufacturer's warranty applies to parts replacements, sizing changes, or adjustments required to appropriately match DECS to the target engine. This clarification is necessary because coverage has been denied in the past due to misinterpretation of the extent of the warranty coverage requirements by applicants. If an applicant incorrectly sizes their DECS or makes a sizing change based on in-field issues at the time of installation, they must honor the full extent of their warranty responsibilities

(c) Diesel Emission Control Strategy Warranty Report. Modifications to this section include clarifications to the format and content of both the annual and supplemental warranty reports. Currently, applicants are required to submit an annual warranty report to the Executive Officer and a supplemental report within 30 days if warranty claims exceed four percent of the number of engines using an applicant's DECS. This section was modified to clarify that applicants must include all warranty claims in their annual report but should delineate valid claims from those claims where warranty service was denied.

A supplemental warranty report is also required of all applicants any time claims exceed the four percent threshold. However, the four percent threshold is not clearly defined. Therefore, this section was modified to clarify that the four percent threshold is defined as the cumulative number of valid warranty claims for the same part or component of the DECS divided by the cumulative sales or leases for the DECS family. Any time the cumulative number of valid warranty claims for the same part or component of an applicant's DECS exceed four percent of the cumulative sales or leases for the DECS family, they are required to submit an additional warranty report within 30 calendar days. The proposed changes are necessary to ensure adequate warranty protections

for end-users of these devices and to support the proposed recall provisions. Additional changes to this section include the requirement that applicants submit their warranty reports in the format specified by the Executive Officer.

(c)(1) This subsection has been modified to clarify those annual sales and lease data must be submitted for the calendar year and not an applicant's fiscal year for all California verified DECS. This proposed change is necessary to ensure that all applicants are submitting sales data that corresponds with the preceding calendar year.

(c)(2) This subsection has been modified to clarify production data must be submitted for the calendar year and not the applicant's fiscal year for all California verified DECS. Again, this proposed change is necessary to ensure that all applicants are submitting production data that corresponds with the preceding calendar year.

(c)(3) This subsection has been modified to clarify that the annual summary of all warranty claims must cover the given calendar year for all California verified DECS.

(c)(3)(A) This subsection has been modified by including "parts" along with components and specifying that claims must be categorized by DECS family name to provide clarity to applicants.

(c)(3)(B) This subsection has been modified for clarity by replacing the word "model" with "family", as in "DECS family", and changing "systems" to "strategies".

(c)(3)(C) This subsection has been modified for clarity by replacing "system" with "strategy" and including "part" with components.

(c)(3)(D) This new subsection clarifies that applicants must provide information on the annual and cumulative replacements and repairs of each part or component to support the four percent calculation mentioned in 2707(c) above.

(c)(3)(E) This new subsection clarifies that applicants must provide contact information for each end-user that files a request for warranty service. The proposed change is necessary to validate each applicants annual or supplemental warranty report.

(c)(4) This subsection has been modified for clarity by replacing "system" with "strategy".

(c)(6) This new subsection clarifies that applicants must include a list of their authorized installers with their annual report to support the proposed changes to section 2706.

(c)(7) This new subsection stipulates penalties for any applicant that fails to submit the required annual or supplemental warranty reports within the specified time periods.

(c)(8) This new subsection clarifies that any warranty report that does not contain all required information will not be considered complete.

(d) Installation Warranty Report. This new section was added requiring authorized installers to also file an annual installation warranty report and to share this information with the manufacturer(s) for which they are authorized to install. The original intent of the Procedure was that this information would be forwarded to the applicants and included in their annual warranty reports. During the public process staff was made aware that this does not always happen. Several applicants stated that they are not receiving information from installers regarding warranty claims and have no authority to compel them to forward this information to them for inclusion in their required reports. The proposed change is necessary to assist applicants and to ensure that ARB is able to reasonably monitor the situation.

The installation warranty report, required by March 1 of each calendar year, is structured in the same format as the applicants product warranty report but is focused on warrantable events that pertain to the installation, which is largely an issue of workmanship. Clarifying language was added specifying that installers are only responsible for the installation warranty, not the product warranty, and must provide the same level and length of coverage for the installation that DECS manufacturers provide for their products.

(d)(1) – (d)(5) These new subsections specify the information that needs to be included in the annual installation warranty report.

(d)(6) This new subsection stipulates penalties for any applicant that fails to submit the required installation warranty reports within the specified time period.

(d)(7) This new subsection clarifies that any installation warranty report that does not contain all required information will not be considered complete.

### **Amendments to Title 13, CCR, Section 2708. Determination of Emissions Reductions.**

This section provides the methodology used to calculate the percent emissions reduction from the applicants valid test results and categorization of the DECS by the Executive Officer. The proposed changes include minor clarifications to the methodology.

(a)(1)(B) Changes to this subsection include minor modification to clarify the requirements for applicants seeking verification of NO<sub>x</sub> reductions.

(b) Categorization of the Diesel Emission Control Strategy. This section has been modified to clarify that the emissions reductions demonstrated by each test set must be greater than or equal to the minimum level the DECS is categorized to. The proposed change is necessary because the calculations for determining emissions reductions are based on the averages of several replicate test sets and applicants have requested categorization even though one or more test sets show performance below the requested categorization level. The proposed change makes it clear that all test sets

must perform at or above the requested categorization level to validate the performance of an applicant's DECS.

(b)(1)(A), (b)(1)(B), (b)(1)(C), and (b)(1)(D) These subsections were updated to correct the numbering sequence.

(b)(2)(A), (b)(2)(B), (b)(2)(C), (b)(2)(D), and (b)(2)(E) These subsections were updated to correct the numbering sequence.

### **Amendments to Title 13, CCR, 2709. In-Use Compliance Requirements.**

The Procedure currently requires applicants to demonstrate the continuing functionality and durability their DECS through in-use compliance testing. Applicants are required to identify and obtain actual in-use systems and perform testing that replicates the tests done to receive their initial verification. This section identifies the in-use compliance requirements. The proposed changes include a reduction in the amount of required in-use emissions testing, the introduction of in-field tests, an alternative test schedule, additional clarifications, proposed changes intended to streamline the process, and proposed recall provisions.

(a) Applicability. The section has been updated to clarify several subcategories of off-road and stationary applications to assist applicants. While these applications have always been subject to the in-use compliance requirements the proposed changes are intended to provide additional guidance to applicants. Applicability now specifically identifies those DECS for marine, Rubber-Tired Gantry (RTG) crane, Auxiliary Power Unit (APU), and Transport Refrigeration Unit (TRU) applications.

Additional modifications to this section include an increase in the sales trigger that determines when an applicant must begin the in-use testing process and a second sales trigger to align with the proposal to replace one set of in-use compliance emissions testing with field testing. Currently, applicants are required to begin in-use testing when 50 units of a DECS family have been sold or leased in the California market. The proposed amendments replace the first set of required in-use emissions tests with less expensive field tests. To support this proposed change this section has been modified to require applicants to begin their in-use field tests after selling or leasing 100 units in the California market. This change is necessary to provide economic relief to applicants.

Applicants are still required to perform the second set of in-use emissions tests. However, it is no longer appropriate to base the in-use test requirements with only one sales trigger. Therefore, the modifications to this section include a second sales trigger. The proposed changes require applicants to begin their in-use compliance emissions tests after selling or leasing 300 units in the California market. This change is necessary to align the sales trigger with the rest of the proposed changes and to provide additional economic relief to applicants.

(a)(1) This new subsection addresses a previous oversight in the in-use compliance requirements. For entirely fuel-based strategies, there are no components or parts that would constitute a sales unit so sales thresholds don't apply. Therefore, the proposed changes include a maximum volumetric threshold coupled with a time requirement that will trigger when in-use compliance testing must begin. The proposed changes require applicants of fuel-based DECS to begin the in-use compliance emissions testing when 6 million gallons of treated or alternative fuel are sold in the California market, or 3 years after receiving verification, whichever comes first.

(a)(2) This new subsection clarifies that the Executive Officer may specify an alternative trigger for fuel-based DECS at the time of verification based on economic or engineering justifications provided by the applicant. This proposed modification is necessary due to the unique nature of fuel-based DECS.

(b) Alternative Test Schedule. This new section provides an alternative test schedule that would allow applicants to forego field testing upon selling or leasing 100 units and move directly to emissions testing. This will reduce an applicant's current in-use testing requirements by half and provide significant economic relief.

(c) Age of Test Units. This section was updated to correct the numbering sequence and to accommodate the proposed field and emissions testing changes. Currently, in-use compliance testing is required in two separate phases, referred to as "Phase 1" and "Phase 2". The proposed changes replace "Phase 1" with field testing and "Phase 2" with emissions testing to align with the proposed changes.

(c)(1) This subsection was updated to clarify the proposed change to field testing and modified for clarity by replacing the word "obtain" with "identify" and changing "systems" to "strategies".

(c)(2) This subsection was updated to clarify the proposed change to emissions testing and modified to allow applicants to select test units that have been operated for at least 60 percent of their minimum warranty period or for three years, whichever comes first. The proposed changes will make it easier for applicants to locate test units and streamline the in-use testing process.

(d) In-Use Compliance Testing Proposals. This section was updated to correct the numbering sequence and to clarify the requirements for submitting in-use compliance testing proposals. After reaching the appropriate sales trigger each applicant begins the in-use testing process by submitting a testing proposal. The proposed changes clarify that test proposals must be submitted no later than 90 days after meeting the appropriate sales trigger and specify separate proposals for each DECS family for both field and emissions testing. In addition, the proposed changes require any applicant that fails to submit their in-use compliance field testing proposal within 90 days after selling or leasing the 100<sup>th</sup> unit to follow the alternate test schedule. This last requirement has been added to provide an incentive to applicants to submit their testing proposals within the applicable timeframe.

Other modifications to the section include a detailed list of the minimum requirements and information required by applicants for both field and emissions testing proposals. These changes are necessary to align with the other proposed changes to the in-use compliance requirements and to streamline the process by providing applicants with the minimum requirements necessary to develop their testing proposals for submission and review by the Executive Officer.

(e) Selection of Diesel Emission Control Strategies for Testing. This section was updated to correct the numbering sequence and to clarify that applicants are required propose for each DECS family a representative sample of ten installed DECS for potential in-use testing for both field and emissions testing. Other modifications include a clarification that each applicant must provide an explanation of the methodology used to ensure that the ten installed DECS are representative of the engines or vehicles equipped with the strategy, and to provide information on each DECS cleaning history if available. These changes are necessary to align with the other proposed changes and to ensure that an applicant's in-use test results are sufficient to validate the continuing functionality and durability of their verified systems.

(f) Selection of Test Engines. This section was updated to correct the numbering sequence and to clarify the test engine selection requirements. These updates include replacing the word "candidate" with "proposed" and changing "systems" to "strategies" where appropriate. Other modifications include specifying the selection of test engines for "emissions" testing to avoid confusing this requirement with field testing, clarification that the Executive Officer may require in-use testing using the engine on which the DECS is installed if the DECS effects the performance on the engine as with some fuel-based strategies, and clarification regarding how applicants may determine if a selected test engine is in a proper state of maintenance. These proposed changes clarify the selection requirements, align with the other proposed changes, and streamline the in-use compliance process.

(g) Number of Diesel Emission Control Strategies to be Tested. This section was updated to correct the numbering sequence and to align the requirements with the other proposed changes. Currently, applicants are required to test a minimum of four candidate test units for each Phase of in-use compliance testing. The modifications to this section require applicants to test eight candidate test units for field testing and make no changes to the number of candidate test units for emissions testing. Other minor modifications to this section are proposed to align the language with the current proposal. These changes are necessary to ensure a sufficient number of candidate test units are examined by applicants performing field tests to ensure that the verified strategies continues to remain functional and durable while providing applicants with a cost effective alternative to the currently required emissions testing.

(g)(1) This subsection was updated to clarify that eight candidate test units are required for field testing and for each test unit that fails; two more test units from the same DECS family must be identified and tested.

(g)(2) This new subsection clarifies that four candidate test units are required for emissions testing and for each test unit that fails; two more test units from the same DECS family must be identified and tested.

(g)(3) This subsection was modified to correct the numbering sequence and clarify that for both field and emissions testing no more than ten candidate test units may be tested. This is the current requirement and the proposed changes are only necessary to align this subsection with the other proposed changes.

(g)(4) This subsection was modified to correct the numbering sequence and to align the subsection with the other proposed changes.

(h) In-Use Compliance Field Testing. This new section is necessary to identify the general requirements for field testing. The proposed changes clarify the field testing requirements by specifying that applicants must propose a test methodology that can be used in-field to determine if their DECS continues to successfully reduce emissions. For some types of DECS, the proposed testing may be qualitative, such as a smoke opacity test or may require more quantitative test, such as the use of a Portable Emissions Monitoring System (PEMS). For all types of DECS applicants are required to use good engineering judgment and propose a test methodology that shows that their verified strategy continues to effectively reduce emissions. Other proposed changes require applicants to propose visual and functional test that can be performed in-field to demonstrate that their strategies remain intact and fully functional. These proposed tests, submitted with an applicant's testing proposal, must include proposed criteria to determine compliance. These proposed changes are necessary to implement field test provisions and will provide significant economic relief to all applicants.

(i) In-Use Compliance Emissions Testing. This section was updated to correct the numbering sequence and to clarify that applicants must propose visual and functional tests, similar to those used for field testing, along with their emissions tests. Requiring functional tests will provide additional economic relief to applicants by allowing supporting components and systems of the DECS to be tested without the need to remove and replace them. As with field testing, applicants are required to use good engineering judgment and propose a test methodology to verify that all parts of the DECS are intact and functioning as originally verified.

(j) Alternative Test Cycles and Methods. This section was updated to correct the numbering sequence and to clarify that for in-use compliance field testing, any proposed alternate test plan must show that DECS continues to function properly and will indicate if the DECS is compromised in any way.

(k) In-Use Compliance Report. This section was updated to correct the numbering sequence and to align this section with the other proposed changes. These clarifications include the use of the proposed naming convention for field and emissions testing, the proposed sales triggers, and the information for each candidate test unit that

must be included in the final report. The proposed changes provide applicants with 18 months to complete either field or emissions testing and submit the appropriate final report. The proposed changes are necessary to align with the other proposed changes and to streamline the in-use compliance process.

(l) This section was updated to correct the numbering sequence and to align the four percent warranty requirements that may trigger additional in-use testing with the changes previously discussed in section 2707(c).

(m) Conditions for passing In-Use Compliance Testing. This section was updated to correct the numbering sequence and to align the requirements for passing in-use compliance testing with the proposed changes to the field and emissions testing requirements. Currently, an individual DECS meets the requirements for passing in-use compliance for either Phase of testing if it reduces emissions by at least 90 percent of the lower bound of the emission reduction level it was originally verified to and meets the NO<sub>2</sub> requirements of the Procedure. In addition, for each DECS family name, if more than 4 units are tested, 70 percent of all units tested must meet these requirements. The proposed modifications include the addition of the visual and functional tests for passing in-use compliance field and emissions testing and the requirement to test eight candidate test units for in-use compliance field testing.

(m)(1) In-Use Compliance Field Testing. This new subsection specifies that each DECS subject to in-use compliance field testing passes in-use compliance testing if it meets the requirements specified in (m)(1)(A) and (m)(1)(B).

(m)(1)(A) This new subsection specifies that each test unit must meet the proposed opacity level or alternate criteria in the applicants approved in-use compliance test plan approval letter.

(m)(1)(B) This new subsection specifies that each test unit must meet the proposed visual and functional test criteria in the applicants approved in-use compliance test plan approval letter. If the first eight test units meet the criteria in (m)(1)(A) and (m)(1)(B), the DECS family passes in-use compliance field testing. If any of the first eight fail, and more than eight are tested, at least nine test units must meet these requirements for the DECS family to pass in-use compliance field testing.

(m)(2) This section was updated to correct the numbering sequence and to clarify that each DECS subject to in-use compliance emissions testing passes in-use compliance testing if it meets the requirements specified in (m)(2)(A), (m)(2)(B), and (m)(2)(C).

(m)(2)(A) This subsection was updated to correct the numbering sequence and to clarify that the emissions test results for each candidate test unit must reduce emissions by at least 90 percent of the lower bound of the emission reduction level it was originally verified to.

(m)(2)(B) This new subsection specifies that each test unit must meet the proposed visual and functional test criteria in the applicants approved in-use compliance test plan approval letter.

(m)(2)(C) This subsection was updated to correct the numbering sequence. This section continues to specify that each candidate test unit must meet the NO<sub>2</sub> requirements of the Procedure. Other minor modifications to the section are for clarity only and to align the existing requirements with the other proposed changes.

(n) Failure of In-Use Compliance Testing. This section was updated to correct the numbering sequence and other minor clarifications for consistency.

(n)(2) For consistency, “systems” was replaced with “strategies”.

(n)(3) For consistency, “systems” was replaced with “strategies” and clarifying language included to identify “DECS family”.

(o) This section was updated to correct the numbering sequence and clarifies that failing to adhere to the proposed recall provisions may lower the verification level or revoke the verification status of the verified DECS family.

(p) Recall Provisions. This new section identifies the requirements of the proposed recall provisions. The proposed recall provisions provide the Executive Officer with the authority to determine whether the recall of a DECS family is appropriate based on a review of an applicant’s in-use compliance report, remedial report, warranty report, enforcement testing results, or any other information. The proposed provisions specify that a recall may be triggered by catastrophic failure or other safety related failure, failing to meet the conditions for passing in-use compliance testing, valid warranty claims in excess of the four percent threshold specified in section 2707(c), or if a substantial number of units of the DECS family experience the failure of an operational feature.

An operational feature failure is defined as the failure of one or more features of a DECS that by itself, may not lead directly to a warrantable event but renders the system unable to function properly. In essence, it’s the failure of a control strategy that’s an integral part of DECS that may not lead to the failure of a part or a component and therefore, may not directly trigger a warrantable event. For example, if an applicant’s DECS employed a specific algorithm that due to its design doesn’t adequately notify the end-user in a timely fashion of a high backpressure event, then that algorithm may be considered an operational feature failure.

The proposed changes specify that in the event of a recall the Executive Officer shall provide notification to the applicant that includes a description of the failure, the factual basis for the recall determination, and shall designate a date at least 60 days from the receipt of the notification for submission of a recall plan by the applicant. The proposed changes also specify that recalls must address all DECS of the affected DECS family

including all DECS sold a California verified, and that the recall plan must be approved by the Executive Officer.

(q) Recall Plan. This new section identifies the minimum requirements for a recall plan. The proposed changes specify the minimum requirements and are provided to guide applicants in the development and submission of their recall plans. The minimum requirements include: a description of the DECS subject to recall, the number of units affected, information needed to identify recalled units, a description of the failure and the specific repairs or modifications that will be used to correct the deficiencies, the method of contact for the end-users of the affected units and a contact schedule, a copy of any notification letters planned, any planned incentives to induce compliance with the recall effort, repair or replacement instructions, and information on the potential impact the recall may have on the vehicle or equipment.

(r) Reporting Requirements. This new section requires any applicant subject to recall to report quarterly progress of their recall efforts for six consecutive quarters beginning with the quarter after the recall begins.

(s) This section was updated to correct the numbering sequence and to clarify that the provisions of the section also apply to the requirements of section 2709, including the proposed recall provisions. Other modifications include the identification of penalties for any applicant that fails submit a recall plan or to complete the requirements of an approved recall plan.

### **Amendments to Title 13, CCR, Section 2710. Verification of Emissions Reductions for Alternative Diesel Fuels and Fuel Additives.**

This section identifies the test procedures and methods that are required for the verification of DECS that use alternative diesel fuels or fuels additives.

Table 6 Fuel Test Methods and Reference Fuel Specifications. This table was updated to correct several typographical errors and to update the test procedure for American Petroleum Institute (API) gravity. An additional American Society for Testing and Materials (ASTM) test procedure was included; ASTM test method D4052 was added for the determination of API gravity as it is this test method that most fuel testing laboratories, including ARB, are now using in place of the previous method.

(d)(3)(A)(1) The proposed change to this subsection amends the emissions test procedure from a minimum of five tests to nine tests to align with the other test procedures.

(d)(3)(A)(2) The proposed changes to this subsection amends the number of tests in the emissions test sequence from twenty to nine. The existing twenty test matrix was adopted based on ARB's Diesel Fuel regulations and is designed to show equivalency between a candidate fuel and reference fuel. This test matrix includes twenty replicate tests because this amount of replicate testing is needed to show fuel equivalency for determining differences in the measured pollutant parameters of as little as one to two

percent. Because fuel equivalency testing requires this level of resolution, a significant number of replicate tests are necessary to eliminate test-to-test variability and provide statistical viability. However, unlike fuel equivalency testing, verification emissions tests are designed to show a percent reduction from a control strategy as compared to a set of baseline tests (i.e. baseline verses controlled). In addition, the health effects testing often required during the multimedia evaluation currently uses nine replicate tests to generate the statistically valid results from the composite tests for each fuel. Therefore, the proposed changes include reducing the number of replicate tests from twenty to nine.

Other modification include clarifying language requiring fuel additives that accumulate within the fuel system, engine, or exhaust system to use the same test engine or engines for both emissions and durability testing and requiring these types of additives to perform post-durability tests at higher dosage rates to determine any long term effects of the additive. These requirements are necessary in order to determine the effect of any accumulation of the additive or alternative fuel and to determine at what point these effects will stabilize.

(e)(1) This subsection was updated to correct the numbering sequence and to clarify which subsections are applicable to meet the durability requirements of section 2407.

(e)(2) This subsection was updated to correct the section reference.

(e)(3) This new subsection is proposed to clarify that the same test engine used for emissions testing must be used for durability testing for fuel additives that accumulate within the fuel system, engine, or exhaust system.

(g)(4)(A) This new subsection is proposed to include a labeling requirement for entirely fuel-based strategies. This requirement addresses an oversight in the labeling requirements found in Section 2706. The labeling requirements in Section 2706 require identification of the year and month of manufacture of the DECS or a unique serial number on each label. This portion of the requirement makes little sense for a strategy that is likely to be continuously replenished. Therefore, the proposal includes clarifying language exempting strategies that do not include exhaust aftertreatment (e.g. entirely fuel-based strategies) from providing the month and year of manufacture or a unique serial number.

(h) Conditional Verification. This section was removed as it conflicted with the other conditional verification requirements of section 2706. This option for conditional verification of an alternative diesel fuel or fuel additive for off-road or stationary applications was removed, as it requires the applicant to first obtain an on-road conditional verification. This conflicts with section 2706 as conditional verification is not offered as a path to verification for on-road applications.

(h) Extensions of an Existing Verification. This section was update to correct the numbering sequence and to correct the section reference.

### **Amendments to Title 13, CCR, Section 2711. Compliance.**

This section identifies general compliance requirements that apply to all verified DECS.

- (a) This new section provides clarification that all ARB verified DECS must be properly installed and maintained.
- (b) This section was updated to correct the numbering sequence.
- (c) This section was updated to correct the numbering sequence.
- (d) This section was updated to correct the numbering sequence.
- (e) This new section provides clarification that tampering with an installed ARB verified DECS is not allowed.

## REFERENCES

ARB, 2000. California Air Resources Board. *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles*. California Air Resources Board, October 2000. <http://www.arb.ca.gov/diesel/documents/rrpFinal.pdf>. Last accessed December 6, 2011.

Society of Automotive Engineers, 1996. *J1667: Snap Acceleration Smoke Test Procedure for Heavy-Duty Powered Vehicles*, Society of Automotive Engineers Recommended Practice, Issued February 1996. <http://www.arb.ca.gov/enf/hdvp/saej1667.pdf>. Last accessed January 6, 2012.

ASTM D4052-96(2002): Standard Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter, American Society for Testing and Materials, reapproved January 1, 2002.