California Environmental Protection Agency

Air Resources Board

LOCATION:
Air Resources Board
Byron Sher Auditorium, Second Floor
1001 I Street
Sacramento, California 95814
http://www.calepa.ca.gov/EPAbldg/location.htm

PUBLIC MEETING AGENDA

This facility is accessible by public transit. For transit information, call (916) 321-BUSS, website: http://www.sacrt.com
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Thursday, December 12, 2013

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

December 12, 2013
9:00 a.m.

CONSENT CALENDAR:

The following items on the consent calendar will be presented to the Board immediately after the start of the public meeting, unless removed from the consent calendar either upon a Board member's request or if someone in the audience wishes to speak on it.

Consent Item #

13-11-5: Public Meeting to Consider Appointment of a New Member to the Research Screening Committee

Staff will recommend the appointment of Dr. Yifang Zhu to the Research Screening Committee to fill the vacancy left by the resignation of Dr. Tracy Thatcher from Cal Polytechnic State University. The Board's Research Screening Committee consists of scientists, engineers, and others who are knowledgeable, technically qualified, and experienced in air pollution research.

DISCUSSION ITEMS:

Note: The following agenda items may be heard in a different order at the Board meeting.

Agenda Item #

13-11-1: Public Hearing to Consider the Proposed Greenhouse Gas (GHG) Regulations for Medium- and Heavy-Duty Engines and Vehicles, Optional Reduced Emission Standards For Heavy-Duty Engines, and Amendments to the Tractor-Trailer GHG Regulation, Diesel-Fueled Commercial Motor Vehicle Idling Rule, and the Heavy-Duty Hybrid-Electric Vehicles Certification Procedures

Staff will propose for Board consideration five regulations or regulatory amendments, all related to on-road medium- and heavy-duty engines and vehicles and all intended to help usher in new generations of lower-emitting trucks by establishing new GHG and optional NOx standards and by enhancing the enforcement and implementation of existing requirements. The proposals include new GHG standards for medium- and heavy-duty engines and vehicles, amendments to the Tractor-Trailer GHG Regulation, a new set of optional NOx

standards for heavy-duty engines, amendments to ARB's Diesel Idling Measure, and amendments to the Heavy-Duty Hybrid-Electric Vehicles Certification Procedures.

13-11-2: Public Hearing to Consider the Proposed Regulation on the Commercialization of New Alternative Diesel Fuels

Staff will present for the Board's consideration a regulation that establishes a multistage process governing the commercialization of new alternative diesel motor vehicle fuels in California.

13-11-3: Public Meeting to Hear the Planned Air Pollution Research for Fiscal Year 2014-2015

Staff will present to the Board the proposed 2014-2015 Research Plan. This Research Plan includes 14 projects needed to support attainment of air quality standards and meet greenhouse gas reduction goals. Research included in this plan will examine the extent and effects of air pollution exposure and associated mitigation strategies, support the Advanced Clean Cars program, enhance modeling techniques for criteria pollutants, improve estimates of emissions from off-road vehicles, and investigate the potential to lower greenhouse gas emissions from multiple sectors.

CLOSED SESSION

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

POET, LLC, et al. v. Goldstene, et al., Superior Court of California (Fresno County), Case No. 09CECG04850; plaintiffs' appeal, California Court of Appeal, Fifth District, Case No. F064045; California Supreme Court, Case No. S213394.

Rocky Mountain Farmers Union, et al. v. Corey, U.S. District Court (E.D. Cal. Fresno), Case No. 1:09-CV-02234-LJO-DLB; interlocutory appeal, U.S. Court of Appeals, Ninth Circuit, Case Nos. 09-CV-02234 and 10-CV-00163.

American Fuels and Petrochemical Manufacturing Associations, et al. v. Corey, et al., U.S. District Court (E.D. Cal. Fresno), Case No. 1:10-CV-00163-AWI-GSA; interlocutory appeal, U.S. Court of Appeals, Ninth Circuit, Case Nos. 09-CV-02234 and 10-CV-00163.

Association of Irritated Residents, et al. v. United States Environmental Protection Agency, 2011 WL 310357 (C.A.9), (Feb. 2, 2011).

California Dump Truck Owners Association v. Nichols, U.S. District Court (E.D. Cal. Sacramento), Case No. 2:11-CV-00384-MCE-GGH; plaintiffs' appeal, U.S. Court of Appeals, Ninth Circuit, Case No. 13-15175.

Engine Manufacturers Association v. California Air Resources Board, Sacramento Superior Court, Case No. 34-2010-00082774; defendant's appeal, California Court of Appeal, Third District, Case No. C071891.

Truck and Engine Manufacturers Association v. California Air Resources Board, Sacramento Superior Court, Case No. 34-2013-00150733.

Alliance of Automobile Manufacturers v. California Air Resources Board; Sacramento Superior Court, Case No. 34-2013-00152974.

Citizens Climate Lobby and Our Children's Earth Foundation v. California Air Resources Board, San Francisco Superior Court, Case No. CGC-12-519554, plaintiffs' appeal, California Court of Appeal, First District, Case No. A138830.

California Chamber of Commerce et al. v. California Air Resources Board, Sacramento Superior Court, Case No. 34-2012-80001313.

Morning Star Packing Company, et al. v. California Air Resources Board, et al., Sacramento Superior Court, Case No. 34-2013-800001464.

Delta Construction Company, et al. v. United States Environmental Protection Agency, U.S. Court of Appeals, District of Columbia Circuit, Case No. 11-1428.

City of Los Angeles through Department of Water and Power v. California Air Resources Board, et al., Los Angeles Superior Court, Case No. BS140620 (transferred to Sacramento Superior Court, Case No. 34-2013-80001451-CU-WM-GDS).

Alliance for California Business v. Nichols et al., Glenn County Superior Court, Case No. 13CV01232.

Dalton Trucking, Inc. v. United States Environmental Protection Agency, U.S. Court of Appeals, District of Columbia Circuit, Case No. 13-1283.

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

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

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

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

TO ELECTRONICALLY SUBMIT WRITTEN COMMENTS ON AN AGENDA ITEM IN ADVANCE OF THE MEETING GO TO:

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

(Note: not all agenda items are available for electronic submittals of written comments.)

ONLINE SIGN-UP:

You can sign up online in advance to speak at the Board meeting when you submit an electronic Board item comment. For more information go to:

http://www.arb.ca.gov/board/online-signup.htm

(Note: not all agenda items are available for online sign-up.)

IF YOU HAVE ANY QUESTIONS, PLEASE CONTACT THE CLERK OF THE BOARD:
1001 I Street, 23rd Floor, Sacramento, California 95814
(916) 322-5594
ARB Homepage: www.arb.ca.gov

SPECIAL ACCOMMODATION REQUEST

Consistent with California Government Code Section 7296.2, special accommodation or language needs may be provided for any of the following:

- An interpreter to be available at the hearing;
- Documents made available in an alternate format or another language;
- A disability-related reasonable accommodation.

To request these special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by facsimile at (916) 322-3928 as soon as possible, but no later than 7 business days before the scheduled Board hearing. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

Consecuente con la sección 7296.2 del Código de Gobierno de California, una acomodación especial o necesidades lingüísticas pueden ser suministradas para cualquiera de los siguientes:

- Un intérprete que esté disponible en la audiencia
- Documentos disponibles en un formato alterno u otro idioma
- Una acomodación razonable relacionados con una incapacidad

Para solicitar estas comodidades especiales o necesidades de otro idioma, por favor llame a la oficina del Consejo al (916) 322-5594 o envié un fax a (916) 322-3928 lo más pronto posible, pero no menos de 7 días de trabajo antes del día programado para la audiencia del Consejo. TTY/TDD/Personas que necesiten este servicio pueden marcar el 711 para el Servicio de Retransmisión de Mensajes de California.

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

California Environmental Protection Agency

Air Resources Board

PUBLIC MEETING AGENDA

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TITLE 13. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER THE PROPOSED REGULATION ON THE COMMERCIALIZATION OF NEW ALTERNATIVE DIESEL FUELS

The Air Resources Board (ARB or Board) will conduct a public hearing at the time and place noted below to consider a proposed regulation governing the commercialization of motor vehicle Alternative Diesel Fuels (ADF). The ADF regulation is intended to provide a legal pathway for emerging diesel fuel substitutes to enter the commercial market in California, to manage and minimize environmental and public health impacts, and to preserve the emissions benefits derived from the ARB motor vehicle diesel regulations.

DATE: December 12, 2013

TIME: 9:00 a.m.

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

This item may be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., December 12, 2013, and may continue at 8:30 a.m., on December 13, 2013. This item may not be considered until December 13, 2013. Please consult the agenda for the hearing, which will be available at least 10 days before December 12, 2013, to determine the day on which this item will be considered.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW PURSUANT TO GOVERNMENT CODE 11346.5(a)(3)

Sections Affected: Proposed adoption of California Code of Regulations (CCR), title 13, new sections 2293, 2293.1, 2293.2, 2293.3, 2293.4, 2293.5, 2293.6, 2293.7, 2293.8, 2293.9, and Appendix A.

Existing sections 2290, 2291, 2292.1, 2292.2, 2292.3, 2292.4, 2292.5,2292.6, and 2292.7 would be grouped under new subarticle 1 (Specifications for Current Alternative Motor Vehicle Fuels). Existing sections 2293 and 2293.5 would be renumbered to 2294 and 2295, and would be grouped under a new subarticle 3 (Ancillary Provisions).

Documents Incorporated by Reference: The following documents, test methods, and model would be incorporated in the regulation by reference as specified by section:

TITLES 13 and 17. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER PROPOSED GREENHOUSE GAS (GHG) REGULATIONS FOR MEDIUM- AND HEAVY-DUTY ENGINES AND VEHICLES, OPTIONAL REDUCED EMISSION STANDARDS FOR HEAVY-DUTY ENGINES, AND AMENDMENTS TO THE TRACTOR-TRAILER GHG REGULATION, DIESEL-FUELED COMMERCIAL MOTOR VEHICLE IDLING RULE, AND THE HEAVY-DUTY HYBRID-ELECTRIC VEHICLES CERTIFICATION PROCEDURES

The Air Resources Board (ARB or Board) will conduct a public hearing at the time and place noted below to consider the following heavy-duty vehicle related proposals:

- Adoption of new regulations to establish greenhouse gas emission (GHG) standards for medium and heavy-duty engines and vehicles to harmonize with the existing federal GHG emission standards (Phase 1 GHG Emissions Standards) for medium and heavy-duty engines and vehicles, consisting of proposed amendments to title 13, California Code of Regulations (CCR) sections 1900, 1956.8, 2036, 2037, 2112, and 2139, and proposed adoption of new sections title 17, CCR 95660 to 95664;
- Amendments to ARB's existing Heavy-Duty Vehicle GHG Emission Reduction Regulation (Tractor-Trailer GHG regulation) to align with the U. S. EPA Phase 1 GHG Regulations and to clarify the requirements for tractors retrofitted with sleeper-cab compartments, title 17, CCR, sections 95300, 95301, 95302, 95303, and 95305;
- Adoption of new, optional oxides of nitrogen (NOx) standards for heavy-duty vehicle engines, title 13, CCR, sections 1956.8;
- Amendments to the Airborne Toxic Control Measure (ATCM) to Limit Diesel-fueled Commercial Motor Vehicle Idling to expand compliance responsibility, title 13, CCR, section 2485; and
- Amendments to the California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric and Other Hybrid Vehicles in the Urban Bus and Heavy-Duty Vehicle Classes, title 13, CCR, section 1956.8.

DATE: December 12, 2013

TIME: 9:00 a.m.

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

This item may be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., December 12, 2013, and may continue at 8:30 a.m., on December 13, 2013. This item may not be considered until December 13, 2013. Please consult the agenda for the hearing, which will be available at least 10 days before December 12, 2013 to determine the day on which this item will be considered.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW PURSUANT TO GOVERNMENT CODE 11346.5(a)(3)

This notice concerns staff's proposal for five separate, but related regulatory actions related to on-road medium- and heavy-duty vehicles and engines. The sections of the CCR that are affected and documents incorporated by reference are described below for each of the five regulatory actions.

Sections Affected:

Phase 1 GHG Regulations

Proposed amendments to title 13, CCR, sections 1900, 1956.8, 2036, 2037, 2112, 2139, 2140, and 2147, and proposed adoption of new title 17, CCR, sections 95660, 95661, 95662, 95663, and 95664, including the following test procedures that are incorporated by reference herein: Proposed new test procedure entitled "California Greenhouse Gas Exhaust Emission Standards and Test Procedures for 2014 and Subsequent Model Heavy-Duty Vehicles," which would be incorporated by reference in title 17, CCR, 95663(c); proposed amended test procedure "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," last amended April 18, 2013, incorporated by reference in title13, CCR, 1956.8(b); proposed amended test procedure "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines," last amended April 18, 2013, incorporated by reference in title13, CCR, 1956.8(d).

Tractor-Trailer GHG Regulation

Proposed amendments to title 17, CCR, sections 95300, 95301, 95302, 95303, and 95305.

Optional Low NOx Standards

Proposed amendments to title 13, CCR, sections 1956.8, and proposed amendments to "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," last amended April 18, 2013, incorporated by reference in title 13, CCR, section 1956.8(b), and proposed amendments to "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines," last amended April 18, 2013, incorporated by reference in title 13, CCR, section 1956.8(d).

Heavy-Duty Diesel Idling ATCM

Proposed amendments to title 13, CCR, section 2485.

Hybrid-Electric Vehicle Certification Procedures

Proposed amendments to title 13, CCR, section 1956.8, and proposed amendments to "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes," incorporated by reference in title 13 CCR sections 1956.8(b) and 1956.8(d).

Documents Incorporated by Reference:
Phase 1 GHG Regulations

The following documents are incorporated by reference in the proposed amendments to title 13, CCR, section 1956.8:

- "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles," adopted December 12, 2002, as last amended April 18, 2013.
- "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines," adopted December 27, 2000, as last amended April 18, 2013.
- "California Non-Methane Organic Gas Test Procedures," adopted July 12, 1991, as last amended December 6, 2012.

The following document is incorporated by reference in the proposed new title 17, CCR, section 95663:

- New "California Greenhouse Gas Exhaust Emission Standards and Test Procedures for 2014 and Subsequent Model Heavy-Duty Vehicles,"

The following documents are incorporated by reference in 40 CFR 1037.521(d):

- SAE J1252 Wind Tunnel Test Procedure for Trucks and Buses, Revised July 1981.
- SAE J1594 Vehicle Aerodynamics Terminology, Revised July 2010.
- SAE J2071 Aerodynamic Testing of Road Vehicles – Open Throat Wind Tunnel Adjustment, Revised June 1994.

The following documents are incorporated by reference in 40 CFR 1037.610(c):

- SAE J1321 Joint TMC/SAE Fuel Consumption Test Procedures Type II Reaffirmed 1986-10.
- SAE J1526 Joint TMC/SAE Fuel Consumption In-Service Test Procedure Type III Issued 1987-06.

The following documents are incorporated by reference in 40 CFR 1066.20:

- National Institute of Standards and Technology (NIST) Special Publication 811, 2008 Edition, Guide for the Use of the International System of Units (SI), March 2008.

The following documents are incorporated by reference in 40 CFR 1066.310(b):

- SAE J1263 Road Load Measurement and Dynamometer Simulation Using Coastdown Techniques, Revised March 2010.
- SAE J2263 Road Load Measurement Using Onboard Anemometry and Coastdown Techniques, Revised December 2008.

The following document is incorporated by reference in 40 CFR 1066.501:

- SAE J2711 Recommended Practice for Measuring Fuel Economy and Emissions of Hybrid-Electric and Conventional Heavy-Duty Vehicles, Issued September 2002.

The following documents are incorporated by reference in "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles," adopted December 12, 2002, as last amended April 18, 2013, and California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines," adopted December 27, 2000, as last amended April 18, 2013:

- "California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," as amended December 6, 2012.
- "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," as amended December 6, 2012.
- American Society for Testing and Materials (ASTM) D240-09 Standard Test Method for Head of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter, approved July 1, 2009.
- ASTM D4809-09a Standard Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter (Precision Method), approved September 1, 2009.
- ASTM D5291-10 Standard Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Petroleum Products and Lubricants, approved May 1, 2010.

Tractor-Trailer GHG Regulation

None.

Optional Low NOx Standards

- "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles," adopted December 12, 2002, as last amended April 18, 2013.
- "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines," adopted December 27, 2000, as last amended April 18, 2013.

Heavy-Duty Diesel Idling ATCM

- "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as last amended on April 18, 2013.
- "California Exhaust Emission Standards and Test Procedures for 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," as incorporated by reference in title 13 CCR 1961(d).

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Hybrid-Electric Vehicle Certification Procedures

- "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes," adopted October 24, 2002.

Background and Effect of the Proposed Rulemaking:

Phase I GHG Regulation

On November 14, 2011, U.S. EPA and the National Highway Traffic Safety Administration (NHTSA), on behalf of the U.S. Department of Transportation, jointly adopted GHG emission standards and fuel economy standards for 2014 through 2018 model year medium- and heavy-duty engines and vehicles, informally known as the "U.S. Phase 1" GHG regulations or federal Phase 1 program. The U.S. Phase I GHG regulations establish the first federal GHG emission standards for medium- and heavy-duty engines and vehicles.

In this rulemaking action, ARB staff is proposing new regulations to establish GHG emission standards applicable to new vehicles and to amend existing regulations to establish GHG standards applicable to new California medium and heavy-duty vehicle engines. The proposed new regulation and related amendments would align California's GHG emissions standards and test procedures with those of the U.S. Phase I GHG regulation, provide nationwide consistency for engine and vehicle manufacturers, and allow ARB to both certify new motor vehicles and new motor vehicle engines to GHG standards and to enforce those requirements in California.

Tractor-Trailer GHG Regulation

The Board initially approved the Tractor-Trailer GHG regulation (title 17 CCR 95300-95312) on December 11, 2008, and subsequently adopted amendments to the regulation on October 26, 2011. The regulation reduces GHG emissions by requiring long-haul tractors and trailers to be equipped with specified aerodynamic technologies and low-rolling resistance tires that act to reduce the aerodynamic drag and rolling resistance forces acting on such tractors and trailers. The regulation incorporates elements of the U.S. EPA's voluntary SmartWay program, which develops test protocols and establishes performance criteria to verify the GHG emissions reduction benefits of heavy-duty tractors and equipment associated with heavy-duty tractors and trailers. The Tractor-Trailer GHG regulation currently requires 2011 and subsequent model year sleeper-cab tractors pulling 53-foot or longer box-type trailers on California highways to be SmartWay designated tractor models, and 2011 or subsequent day-cab tractors pulling 53-foot or longer box-type trailers on California highways to be equipped with SmartWay verified low rolling resistance (LRR) tires. The Tractor-Trailer GHG regulation also requires both 2011 and newer and 2010 and older 53-foot or longer box-type trailers to either be SmartWay designated trailers or to be retrofitted with SmartWay verified aerodynamic technologies and SmartWay verified LRR tires.

To harmonize the tractor-based requirements of the federal and California regulations, staff is proposing to sunset the tractor-based requirements for 2014 and subsequent model year tractors, but will maintain all elements of the trailer-based requirements of the existing Tractor-Trailer GHG regulation. Staff is also proposing to modify the Tractor-Trailer GHG regulation to clarify the applicability of the tractor-based requirements for tractors that are subsequently retrofitted with sleeper cab compartments and to allow 2014 and newer model year heavy-duty tractors to be eligible for the existing short-haul and local-haul tractor exemptions. The trailers hauled by such short-haul and local-haul tractors would be exempted as well.

Optional Low-NOx Standards

California is the only state that is authorized to adopt and enforce emission standards for new motor vehicles and engines that differ from federal emission standards. Because of the large number of California heavy-duty trucks that travel interstate, ARB has generally aligned California's heavy-duty engine standards with federal heavy-duty engine standards. Since 1990, both California and EPA have established increasingly more stringent emission standards for heavy-duty diesel engines. Specifically, the California and federal emission standards for NOx have been reduced from 6 grams per brake-horsepower hour (g/bhp-hr) in 1990 to the current standard of 0.2 g/bhp-hr.

In addition to the primary NOx standards, California has also established several optional, lower NOx standards over the past 15 years. From 1998 to 2003, optional NOx standards ranged from 2.5 g/bhp-hr to 0.5 g/bhp-hr, at 0.5 g/bhp-hr increments, which were much lower than the mandatory 4.0 g/bhp-hr limit. Starting in 2004, engine manufacturers could choose to certify to optional NOx + non-methane hydrocarbon (NMHC) standards ranging from 1.8 g/bhp-hr to 0.3 g/bhp-hr, at 0.3 g/bhp-hr increments, which was significantly less than the mandatory 2.4 g/bhp-hr NOx+NMHC standard. These optional standards allowed local air districts and ARB to preferentially provide incentive funding to purchasers of cleaner trucks, which encouraged the development of cleaner engines.

ARB presently does not have a mechanism in place to allow heavy-duty engine manufacturers to optionally certify engines to standards more stringent than the 2010 MY standard. To encourage development of lower NOx engines and reduce emissions, ARB staff is proposing to establish the next generation of optional NOx standards for heavy-duty engines, that would specify three optional NOx emission standards of 0.1 g/bhp-hr, 0.05 g/bhp-hr, and 0.02 g/bhp-hr, which would correspond to emission levels that are 50 percent, 75 percent, and 90 percent lower than the current mandatory standard, respectively. Several existing programs such as the Carl Moyer Program and Proposition 1B Program and ARB's Truck and Bus regulation currently provide some incentive for optionally certified engines and could be modified to provide additional incentives for engine manufacturers to certify to the proposed optional standards. To the extent that engine manufacturers elect to certify heavy-duty engines to the optional NOx standards, those optional NOx standards will provide emission benefits and pave the way for future cleaner engines.

Heavy-Duty Diesel Idling ATCM

On July 22, 2004, ARB initially adopted an Air Toxic Control Measure (ATCM) to limit diesel-fueled commercial motor vehicle idling. ARB subsequently adopted amendments to this ATCM on September 1, 2006 and October 19, 2009. This ATCM is set forth at title 13, CCR section 2485, and requires, among other things, that drivers of diesel-fueled commercial motor vehicles with gross vehicle weight ratings greater than 10,000 pounds not idle the vehicle's primary diesel engine longer than five minutes at any location.

ARB staff is proposing to expand the applicability of the idling ATCM to include the vehicle owner and the motor carrier that dispatched the vehicle. Staff is also proposing to include schools, hotels, and motels in the definition of "restricted area." "Restricted area is currently defined as "any real property zoned for individual or multifamily housing units, that has one or more of such units on it," and the existing ATCM prohibits idling of a main engine beyond five minutes or operation of a diesel-fueled auxiliary power unit longer than five minutes when located within 100 feet of a restricted area. The proposed amendments will ensure that emission benefits from the existing ATCM are realized by increasing the regulation's compliance rate and would provide those members of the public who attend schools, or work or reside at hotels and motels, additional protection from exposure to diesel particulate matter and other toxic air contaminants, and the associated potential cancer risks and other adverse health effects associated with diesel emissions.

Hybrid-Electric Vehicle Certification Procedures

On October 24, 2002, ARB approved the adoption of "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes." These interim certification procedures allow manufacturers to voluntarily certify heavy-duty hybrid-electric vehicles using a vehicle-based (as opposed to engine-based) certification. ARB staff is proposing to update the interim certification procedures to clarify and enhance certification requirements due to expanding commercialization and advancement of hybrid technology into more sectors of the heavy-duty market and the need to better quantify emission reductions from existing and future heavy-duty hybrid vehicles. Specifically, the amendments would expand the existing applicability of the certification procedures to allow more vocational vehicles to certify, and would clarify and enhance certification requirements. The amended test procedures would remain as voluntary, interim procedures.

Objectives and Benefits:

ARB has established a comprehensive regulatory program to reduce emissions from on-road medium- and heavy-duty vehicles in California, as part of ARB's program to improve air quality and reduce the emissions that contribute to climate change. This hearing notice encompasses staff's proposals for five proposed regulatory actions that all relate to on-road medium- and heavy-duty vehicles and engines. The objectives and expected benefits of each proposal include:

Phase 1 GHG Regulations: This proposed regulations would establish new GHG emissions standards for 2014 and subsequent model year medium- and heavy-duty engines and vehicles sold in California that are identical to the national GHG emission standards established by U.S. EPA in 2011. This proposed regulations would provide California with the ability to certify new medium-and heavy-duty engines and vehicles to the new standards, and to enforce those standards in California. The proposed Phase 1 GHG regulations would not require additional compliance actions beyond those currently required by the U.S. Phase 1 GHG regulations, hence resulting in no new direct emission benefits.

In 2004, the U.S. Supreme Court clarified that a standard, as it applies to emissions from motor vehicles and motor vehicle engines under Title II of the federal Clean Air Act, relates to the emission characteristics of vehicles or engines and requires motor vehicles or motor vehicle engines to emit no more than a certain amount of a given pollutant, be equipped with a certain type of pollution-control device, or have some other design feature related to the control of emissions. *Engine Manufacturers Association v. South Coast Air Quality Management District* (2004) 541 U.S. 246, 253, 124 S.Ct. 1756, 1762 (*EMA*). Staff is proposing that the Phase 1 GHG regulation add a definition of "emission standard" to be consistent with the definition set forth in *EMA* for purposes of clarity, consistency, and conformity and to clarify that the definition of emission standard as used in the Phase 1 GHG regulation conforms to the federal definition. For purposes of clarification and consistency, ARB staff is also adding the terms "exhaust emission standard" and "evaporative emission standard" in the definitions section to provide more specificity, where needed, to preexisting textual references to emission standards.

Staff is also proposing to add these definitions to title 13, CCR section 1900(b) to clarify that the requirements applicable to on-road motor vehicles and motor vehicle engines set forth in Article 2, Chapter 1, Division 3 of title 13, California Code of Regulations and the associated remedies provided in the Health and Safety Code for noncompliance constitute "emission standards," "evaporative emission standards," or "exhaust emission standards," and to title 13, CCR section 1956.8 to clarify that the proposed amendments to establish optional NOx emission standards for heavy-duty engines (described below) also constitute "emission standards," "evaporative emission standards," or "exhaust emission standards."

Amendments to Tractor-Trailer GHG Regulation: The proposed amendments to ARB's Tractor-Trailer GHG regulation would sunset the requirements applicable to new 2014 and subsequent model year sleeper cab tractors, and would clarify that 2013 MY tractors that are optionally certified to the U.S. Phase 1 GHG regulations are exempted from the Tractor-Trailer GHG regulation. The proposed Phase 1 GHG regulations described above would establish the GHG emission standards for new 2014 and subsequent model year heavy-duty tractors that are currently subject to existing Tractor-Trailer GHG regulation. Overall, the U.S. Phase 1 GHG program in California, including the proposed amendments to sunset the elements of the Tractor-Trailer GHG regulation applicable to 2014 and newer model year heavy-duty tractors, is expected to reduce 3.1 million metric tons carbon dioxide equivalent (MMTCO2e) in 2020 and 7.0 MMTCO2e in

2035, which corresponds to a 7.2 percent reduction in 2020 and 12.5 percent reduction in 2035.

Staff is also proposing to add a definition of "emission standard" to be consistent with the definition set forth in *Engine Manufacturers Association v. South Coast Air Quality Management District* (2004) 541 U.S. 246, 253, 124 S.Ct. 1756, 1762 (*EMA)* for purposes of clarity, consistency, and conformity. Under the federal definition, requirements to equip tractors and trailers with specified aerodynamic equipment and low rolling resistance tires relate to a requirement that a vehicle be equipped with a certain type of pollution-control device or a design feature related to the control of emissions, and are emission standards. The proposed amendments are intended to make clear that the definition of emission standard as used in the Tractor Trailer GHG regulation conforms to the federal definition.

Optional Low NOx Emission Standards: The proposed regulation would establish new, optional NOx standards for heavy-duty vehicle engines that are more stringent than the currently applicable NOx standard of 0.2 g/bhp-hr to encourage the development of new, cleaner engines. Since the proposed regulation would be entirely optional, the associated emission benefits would be dependent upon the level of participation by engine manufacturers. Estimated NOx emission benefits could be as high as 1.2 tons per day (tpd) NOx statewide in 2020, and 6.9 tpd NOx in 2035 if there is a high level of manufacturer participation.

Amendments to Diesel Idling ATCM: Currently, the compliance rate with the idling ATCM is less than desired because only the driver is responsible for an idling ATCM violation and sometimes it is impractical to issue the citation directly to the driver. The proposed amendments to ARB's existing idling ATCM are intended to improve compliance with the existing idling ATCM by (1) expanding the current responsibility for compliance to vehicle owners and motor carriers, and (2) clarifying that restricted areas, which the existing idling ATCM defines as "any real property zoned for individual or multifamily housing units that has one or more of such units on it" also include schools, hotels and motels. The existing idling ATCM prohibits idling of a main engine longer than five minutes or the operation of a diesel-fueled auxiliary power unit longer than five minutes when located within 100 feet of a restricted area. The proposed amendments would provide those members of the public who attend schools, or work or reside at hotels and motels, additional protection from exposure to diesel particulate matter and other toxic air contaminants. The amendments do not modify the requirements of the existing ATCM by establishing additional or more stringent emission standards applicable to truck or off-road engines, but would serve to ensure that the emission benefits of the existing ATCM are realized.

Staff is also proposing to add a definition of "emission standard" to be consistent with the definition set forth in *Engine Manufacturers Association v. South Coast Air Quality Management District* (2004) 541 U.S. 246, 253, 124 S.Ct. 1756, 1762 (*EMA)* for purposes of clarity, consistency, and conformity. Under the federal definition, requirements for heavy-duty commercial motor vehicles to incorporate engine designs

to limit extended idling of the main engine constitute requirements to emit no more than a certain amount of a given pollutant, to be equipped with a certain type of pollution-control device, or have a design feature related to the control of emissions, and are emission standards. The proposed amendments are intended to make clear that the definition of emission standard as used in the ATCM to Limit Diesel-Fueled Commercial Motor Vehicle Idling conforms to the federal definition.

Amendments to ARB's Heavy-Duty Hybrid Electric Vehicle Certification Procedures: The proposed amendments are intended make the certification procedures more broadly applicable to additional vocational vehicles and to heavy-duty plug-in hybrid electric vehicles that have entered the market since the regulation was originally adopted. The proposed amendments would provide a more comprehensive certification process but would not generate additional emissions reductions in the short-term. In the long-term, however, the expanded procedures could enable more hybrid-electric vehicles to be certified and produced, which could provide emission benefits.

DETERMINATION OF INCONSISTENCY AND INCOMPATIBILITY WITH EXISTING STATE REGULATIONS

During the process of developing the proposed regulatory action, ARB conducted a search of similar regulations and has concluded that the proposed regulatory actions are neither inconsistent nor incompatible with existing state regulations.

COMPARABLE FEDERAL REGULATIONS

ARB staff is proposing a new regulation that would establish GHG standards for new 2014 and subsequent model year California medium- and heavy-duty engines and vehicles that are identical to U.S. EPA's Phase 1 GHG regulation (Final Rule Greenhouse Gas Emission Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles, 76 Federal Register 57106-57513, (September 15, 2011), as subsequently amended on August 16, 2013 (78 Federal Register 36, 370-36,406 (June 17, 2013). U.S. EPA's Phase 1 GHG standards establish requirements for three distinct regulatory vehicle classes: combination tractors, vocational vehicles, and heavy-duty pick-up trucks and vans, and generally begin with model year 2014 engines and vehicles and increase in stringency through 2018 model year engines and vehicles.[1]

California's existing Tractor-Trailer GHG regulation currently applies to a subset of the 2014 and newer combination tractors regulated by the U.S. Phase 1 GHG standards. The proposed amendments to the Tractor-Trailer GHG regulation would delete the requirements for 2014 and subsequent model year tractors to be SmartWay designated models and to use SmartWay verified low-rolling resistance tires, and would clarify that 2013 MY tractors that are optionally certified to the U.S. Phase 1 GHG regulations are

[1] The U.S. EPA Phase 1 GHG regulations contain a provision allowing manufacturers the option to certify 2013 model year engines and vehicles in order to obtain emissions credits. 40 CFR 1036.150(e) and 40 CFR 1037.150(a), respectively.

exempted from the Tractor-Trailer GHG regulation. As described above, the proposed Phase 1 GHG regulations would establish GHG standards for new 2014 and subsequent model year California heavy-duty tractors that are essentially harmonized with the U.S. Phase 1 GHG regulations. However, the proposed amendments to the Tractor-Trailer GHG regulation would not affect elements of the Tractor-Trailer GHG regulation that apply to categories of tractors that are not subject to the U.S. EPA's Phase I GHG regulation (2011 through 2013 model year new sleeper cab and new day cab tractors, and 2010 and older model year sleeper cab and day cab tractors) or to new and used 53-foot and longer box-type trailers hauled on California highways.

California has an existing regulation (title 13 CCR section 1956.8(a)(6)) that requires new California-certified 2008 and subsequent model-year on-road diesel engines in heavy-duty diesel vehicles to be equipped with a system that automatically shuts down the engine after five minutes of continuous idling. Manufacturers may also elect to optionally certify such engines to a NOx idling emission standard of 30 grams per hour.

The U.S. Phase 1 GHG regulation contains provisions that provide credits to vehicle manufacturers that elect to utilize automatic engine shutdown systems (40 Code of Federal Regulation, Part 1037, Subpart G, section 1037.660), but does not require new vehicles to incorporate idle shutdown systems. Moreover, the federal idle shutdown system requirements are less stringent and differ from California's requirements. Specifically, the federal regulation allows an engine manufacturer to remove the automatic engine shutdown system once the vehicle has accrued 1.29 million miles whereas California's idle shutdown requirements for new engines do not allow the removal of the automatic engine shutdown system for the life of the vehicle. Therefore, California's new engine idle shutdown requirements are more stringent than the provisions of the U.S. Phase 1 GHG regulations that provide carbon dioxide emission credits to engine manufacturers certifying with automatic engine shutdown systems. The U.S. Phase 1 GHG regulations contain no provision allowing engine manufacturers to optionally certify an engine to a NOx idling emission standard.

California's Heavy-Duty Diesel Idling ATCM prohibits heavy-duty diesel-fueled commercial motor vehicles from idling longer than five minutes, and from operating diesel-fueled auxiliary power systems (APSs) longer than five minutes when located within 100 feet of a restricted area, defined as real property zoned for individual or multifamily housing units that has one or more of such units on it. There are no comparable federal provisions prohibiting the extended idling of diesel-fueled commercial motor vehicles or the extended operation of diesel-fueled APSs within designated areas.

U.S. EPA does not have any optional NOx emission standards for heavy-duty engines comparable to the proposed amendments establishing optional NOx engine emission standards. Similarly, there are no comparable federal provisions comparable to the proposed amendments to California's Interim Hybrid Test Procedures.

In 2004, the United States Supreme Court clarified the definition of standard as it applies to emissions from motor vehicles and motor vehicle engines under Title II of the federal Clean Air Act relates to the emission characteristics of a vehicle or engine and require motor vehicles or motor vehicle engines to emit no more than a certain amount of a given pollutant, be equipped with a certain type of pollution-control device, or have some other design feature related to the control of emissions. (*EMA* 541 U.S. at 253.) The proposed amendments are intended to make clear that the definition of emission standard as used in the Phase 1 GHG regulations, in the Tractor Trailer GHG regulation, in the proposed amendments to establish optional NOx emission standards for heavy-duty engines, and in the requirements applicable to on-road motor vehicles and motor vehicle engines set forth in Article 2, Chapter 1, Division 3 of title 13, California Code of Regulations conform to the federal definition as interpreted.

STATE IMPLEMENTATION PLAN REVISION

If adopted by ARB, ARB plans to submit the proposed regulatory actions to the U.S. EPA for approval as a revision to the California State Implementation Plan (SIP) required by the federal Clean Air Act (CAA). The adopted regulatory actions would be submitted as a SIP revision because they adopt or amend regulations intended to reduce emissions of air pollutants in order to attain and maintain the National Ambient Air Quality Standards promulgated by U.S. EPA pursuant to the CAA.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

ARB staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory actions, which includes a summary of the economic and environmental impacts of the proposal. The report is entitled: *Proposed Greenhouse Gas (GHG) Regulation for Medium-and Heavy-Duty Engines and Vehicles, Optional Reduced Emission Standards for Heavy-Duty Engines, and Amendments to the Tractor-Trailer GHG Regulation, the Diesel-Fueled Commercial Motor Vehicle Idling Rule, and the Heavy-Duty Hybrid-Electric Vehicles Certification Procedures.*

Copies of the ISOR and the full text of the proposed regulatory language, in underline and strikeout format to allow for comparison with the existing regulations, may be accessed on ARB's website listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990, on October 23, 2013.

Final Statement of Reasons Availability

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

Agency Contact Persons

Inquiries concerning the substance of the proposed regulations may be directed to the designated agency contact persons, (Phase 1 GHG and Optional Low NOx Standards) Ms. Kim Heroy-Rogalski at (916) 327-2200, (Tractor-Trailer GHG and Idling Airborne Toxic Control Measure), Mr. Stephan Lemieux at (626) 450-6162, or (Hybrid Certification Procedures), Mr. John Kato at (916) 322-2891.

The agency representative for nonsubstantive inquiries concerning the proposed administrative action may be directed is Ms. Trini Balcazar, Regulations Coordinator, at (916) 445-9564. The Board staff has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

Internet Access

This notice, the ISOR and all subsequent regulatory documents, including the FSOR, when completed, are available on ARB's website for this rulemaking at http://www.arb.ca.gov/regact/2013/hdghg2013/hdghg2013.htm.

DISCLOSURES REGARDING THE PROPOSED REGULATION

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 regulations are presented below.

Fiscal Impact / Local Mandate

Pursuant to Government Code sections 11346.5(a)(5) and 11346.5(a)(6), the Executive Officer has determined that the proposed regulatory actions relating to the amendments to the Tractor-Trailer GHG Regulation, the proposed adoption of new Optional Low NOx Standards, the amendments to the ATCM to Limit Diesel-Fueled Commercial Motor Vehicle Idling, and the amendments to the Heavy-Duty Hybrid Electric Vehicle Certification Procedures would not create costs or savings to any State agency or in federal funding to the State, costs or mandate to any local agency or school district, whether or not reimbursable by the State pursuant to Government Code, title 2, division 4, part 7 (commencing with section 17500), or other nondiscretionary cost or savings to State or local agencies.

Pursuant to Government Code section 11346.5(a)(5) and 11346.5(a)(6), the Executive Officer has further determined that the proposed regulatory action to adopt the Phase 1 GHG regulations would create costs or savings to any State agency or in federal funding to the State. The proposed regulatory action to adopt the Phase 1 GHG regulations would create costs to a state agency (ARB), but would not impose a mandate to any state agency, and would not create costs or mandates on local agency or school district, whether or not reimbursable by the State pursuant to

Government Code, title 2, division 4, part 7 (commencing with section 17500), or other nondiscretionary cost or savings to State or local agencies.

Significant Statewide Adverse Economic Impact Directly Affecting Business, Including Ability to Compete

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

The proposed regulations and regulatory amendments would impose minimal costs on affected parties and have minimal or no economic impacts on businesses due to the voluntary nature of the proposed adoption of the Optional Low NOx Standards and the proposed amendments to the Heavy-Duty Hybrid Electric Vehicle Certification Procedures, and due to the fact that the proposed amendments to the Tractor-Trailer GHG Regulation and to the ATCM to Limit Diesel-Fueled Commercial Motor Vehicle Idling are only directed towards clarifying existing requirements or enhancing the enforceability of existing requirements, rather than imposing new requirements. The proposed adoption of the Phase 1 GHG regulations would impose minimal costs on affected parties because such parties would be subject to nearly identical requirements under the federal Phase 1 GHG regulations.

While the proposed Optional Low NOx standards are completely optional and impose no additional costs on manufacturers that elect not to certify engines to such optional standards, these proposed standards are the only element of the proposal that could have significant new costs ($36 to 279 million over 20 years, depending on the level of participation by engine manufacturers and the NOx emission characteristics of those manufacturers' existing engine families.).

Cost Impacts on Representative Private Persons or Businesses

In developing this regulatory proposal, ARB staff evaluated the potential economic impacts on representative private persons or businesses. The conclusions are summarized below and discussed further in the ISOR:

1. Phase 1 GHG Regulations

Complying with the federal Phase 1 GHG standards will impose costs on engine and vehicle manufacturers; however, California's proposed harmonization with the federal Phase 1 standards will only impose minimal additional costs on manufacturers; primarily, costs to provide ARB a copy of materials that manufacturers have submitted to U.S. EPA and some California-specific reporting data to California. Staff expects this to cost no more than $1,000 per manufacturer, with no impact on new vehicle prices.

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2. Tractor-Trailer GHG Regulation
Representative private persons or businesses would not incur any additional costs as result of these amendments.

3. Optional Low NOx Standards
An engine manufacturer that elects to certify engines to the optional NOx standards will incur average certification testing costs of about $20,000 for the model year of initial opt-in, which could be the 2015 model year or a later model year. An engine manufacturer will also incur costs to modify an engine so that its NOx emissions are sufficiently low. The degree of modifications and associated costs are dependent on the emissions characteristics of the base engine, and are estimated to range $0-$6,000 per engine.

Staff estimated cumulative costs for the optional NOx standards using two scenarios. The low adoption rate scenario assumed that 12.7 percent of the applicable fleet will opt to comply with the three-tier standards by full implementation in 2035, and the high adoption rate scenario assumed an adoption rate of 25.7 percent of the applicable fleet in 2035. For each scenario, staff estimated costs using two options (engines would be powered by different percentages of conventional and alternate fuels). Based on the assumed annual participation rates discussed in the Staff Report, staff has estimated that manufacturers would incur hardware costs ranging from $0 to 6,000 per engine to modify engines to meet the low optional NOx standard, plus certification costs of approximately $20,000 per engine family, with the anticipated cumulative cost for the fleet over the 20 year life of the regulation estimated at $36 to $279 million. A detailed description of the cost calculation is provided in the Staff Report.

4. Heavy-Duty Diesel Idling ATCM
The proposed amendments to the Heavy-Duty Diesel Idling ATCM will impose minimal or no additional compliance costs because they are consistent with the existing Heavy-Duty Diesel Idling ATCM's requirement not to idle the main engine of the vehicle or to operate non-compliant alternative idle reduction devices longer than five minutes, and because vehicle owners and motor carriers should already be providing drivers information regarding the idling ATCM.

5. Hybrid-Electric Vehicle Certification Procedures
The proposed amendments to the Heavy-Duty Hybrid-Electric Vehicle Certification Procedures will impose minimal or no additional compliance costs because they are voluntary and consistent with the existing interim certification procedures.

Results of The Economic Impact Analysis/Assessment Prepared Pursuant to Government Code Sec. 11346.3(B)

Effect on Jobs/Businesses:
The Executive Officer has determined that the proposed regulatory actions would not affect the creation or elimination of jobs within the State of California, the creation of new businesses or elimination of existing businesses within the State of California, or

the expansion of businesses currently doing business within the State of California. A detailed assessment of the economic impacts of the proposed regulatory actions can be found in the ISOR, Chapter V.

Benefits of the Proposed Regulation:
The objective of the proposed amendments and new regulations is to harmonize California requirements with federal requirements, and ease enforcement and implementation of existing regulations aimed at improving air quality and reducing the emissions that contribute to climate change.

A summary of the benefits of the proposed amendments and new regulations is provided, please refer to "Objectives and Benefits" above, under the Informative Digest of Proposed Action and Policy Statement Overview Pursuant to Government Code 11346.5(a)(3) discussion earlier in this notice.

Effect on Small Business

The Executive Officer has also determined, pursuant to CCR, title 1, section 4, that the proposed regulatory actions would not affect small businesses because the proposed regulations and regulatory amendments will impose minimal costs on affected parties and have minimal or no economic impacts on small businesses due to the voluntary nature of several of the proposed regulations and regulatory amendments and the fact that the majority of the amendments are aimed at expanding or improving enforcement of existing requirements rather than imposing new requirements. Each regulatory action is discussed further below:

1. Phase 1 GHG Regulation
The Phase 1 GHG requirements would not affect small businesses as small business engine and truck manufacturers are exempted from the proposed Phase 1 GHG Regulations.

2. Tractor-Trailer GHG Regulation
There are no estimated private sector costs for businesses, large or small, for the proposed amendments to the Tractor-Trailer GHG Regulation.

3. Optional Low NOx Standards
There are no estimated costs for small businesses because the businesses affected, engine manufacturers, are large businesses.

4. Heavy-Duty Diesel Idling ATCM
The Heavy-Duty Diesel Idling ATCM affects primarily small businesses; however, the amendments impose minimal or no additional compliance costs.

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5. Hybrid-Electric Vehicle Certification Procedures
The proposed amendments to the Heavy-Duty Hybrid-Electric Vehicles Certification Procedures will impose minimal or no additional compliance costs because they are voluntary and consistent with the existing interim certification procedures.

Housing Costs

The Executive Officer has also made the initial determination that the proposed regulatory actions will not have a significant effect on housing costs.

Business Reports

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the Executive Officer has found that the reporting requirements of the proposed Phase 1 GHG regulations, the amendments to the Tractor-Trailer GHG regulation, the proposed new, Optional Low NOx emission standard, the amendments to the Heavy-Duty Diesel Idling ATCM and the amendments to the Heavy-Duty Hybrid Electric Vehicle Certification Procedures that apply to businesses are necessary for the health, safety, and welfare of the people of the State of California.

Alternatives

Before taking final action on the proposed regulatory actions, the Board must determine that no reasonable alternative considered by the Board, or that has otherwise been identified and brought to the attention of the Board would be more effective in carrying out the purpose for which the action is proposed, or would be as effective and less burdensome to affected private persons than the proposed action, or would be more cost-effective to affected private persons and equally effective in implementing the statutory policy or other provisions of law. Alternatives to the proposed rulemaking are described in ISOR.

Environmental Analysis
In accordance with ARB's certified regulatory program, CCR, title 17, sections 60006 through 60007, and the California Environmental Quality Act, Public Resources Code section 21080.5, ARB staff has conducted an analysis of the potential for significant adverse and beneficial environmental impacts associated with the proposed regulatory actions. The environmental analysis of the proposed regulatory actions can be found in Chapter VI of the ISOR.

WRITTEN COMMENT PERIOD AND SUBMITTAL OF COMMENTS

Interested members of the public may present comments orally or in writing at the meeting and may provide comments by postal mail or by electronic submittal before the meeting. The public comment period for these regulatory actions will begin on October 28, 2013. To be considered by the Board, written comments not physically

submitted at the meeting, must be submitted on or after October 28, 2013 and received no later than 12:00 noon on December 12, 2013 and must be addressed to the following:

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

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

You can sign up online in advance to speak at the Board meeting when you submit an electronic board item comment. For more information go to: http://www.arb.ca.gov/board/online-signup.htm.

Please note that under the California Public Records Act (Gov. Code, § 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request.

ARB requests that written and email statements on this item be filed at least 10 days prior to the hearing so that ARB staff and Board members have additional time to consider each comment. The Board encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

Additionally, the Board requests but does not require that persons who submit written comments to the Board reference the title of the proposal in their comments to facilitate review.

AUTHORITY AND REFERENCE

1. Phase 1 GHG Regulations

This regulatory action is proposed under that authority granted in Health and Safety Code, sections 38501, 38505, 38510, 38560, 39010, 39500, 39600, 39601, 43013, 43018, 43100, 43101, 43102, 43104, 43105, 43106, 43107 and 43806 and Section 28114, Vehicle Code.

This action is proposed to implement, interpret, and make specific sections 38501, 38505, 38510, 38560, 38580, 39002, 39003, 39010, 39500, 39600, 39601, 39667, 43000, 43000.5, 43009.5, 43013, 43017, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43107, 43202, 43204, 43205, 43205.5, 43206, 43210, 43211, 43212, 43213, and 43806, 44004, 44010, 44011, 44012, 44015, and 44017 Health and Safety Code; and Section 28114, Vehicle Code.

2. Tractor-Trailer GHG Regulation

This regulatory action is proposed under that authority granted in Health and Safety Code, sections 38510, 38560, 38560.5, 39010, 39600, and 39601. This action is proposed to implement, interpret or make specific sections 38510, 38560, 38560.5, 39010, 39600, and 39601, Health and Safety Code.

3. Optional Low NOx Standards

This regulatory action is proposed under that authority granted in Health and Safety Code, sections 39010, 39500, 39600, 39601, 43013, 43018, 43100, 43101, 43102, 43104, 43105, 43106, 43107 and 43806, Health and Safety Code; and Section 28114, Vehicle Code. This action is proposed to implement, interpret, and make specific sections 39002, 39003, 39010, 39017, 39033, 39500, 39650, 39657, 39667, 39701, 40000, 43000, 43009, 43009.5, 43013, 43017, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43107, 43202, 43204, 43205, 43205.5, 43206, 43210, 43211, 43212, 43213 and 43806, Health and Safety Code; and Section 28114, Vehicle Code.

4. Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling

This regulatory action is proposed under that authority granted in Health and Safety Code, sections 39600, 39601, 39614(b)(6)(A), 39658, 39667, 43000.5(d), 43013(b), 43013(h), 43018(b), and 43018(c), Health and Safety Code; and *Western Oil & Gas Assn. v. Orange County Air Pollution Control Dist.* (1975) 14 Cal.3d.411. This action is proposed to implement, interpret, and make specific sections 39002, 39003, 39027, 39500, 39600, 39650, 39655, 39656, 39657, 39658, 39659, 39662, 39665, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3, 42402, 42402.1, 42402.2, 42402.3, 42403.5, 42410, 43013, 43018, and 43704 Health and Safety Code; Sections 305, 336, 350, 440, 445, 545, 546, 642, 680, 21400, 22452, 22515, 27153, 40001, 40001(b)(5), California Vehicle Code; and Sections 1201,1900, 1962, 2480, Title13, California Code of Regulations.

5. Hybrid-Electric Vehicle Certification Procedures

This regulatory action is proposed under that authority granted in Health and Safety Code, sections 39500, 39600, 39601, 43013, 43018, 43100, 43101, 43102, 43104, 43105, 43106, 43107 and 43806, Health and Safety Code; and Section 28114, Vehicle Code. This action is proposed to implement, interpret, and make specific sections 39002, 39003, 39500, 39667, 43000, 43009.5, 43013, 43017, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43107, 43202, 43204, 43205, 43205.5, 43206, 43210, 43211, 43212, 43213 and 43806, Health and Safety Code; and Section 28114, Vehicle Code.

HEARING PROCEDURES

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

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

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

SPECIAL ACCOMMODATION REQUEST

Consistent with California Government Code Section 7296.2, special accommodation or language needs may be provided for any of the following:

- An interpreter to be available at the hearing;
- Documents made available in an alternate format or another language; or
- A disability-related reasonable accommodation.

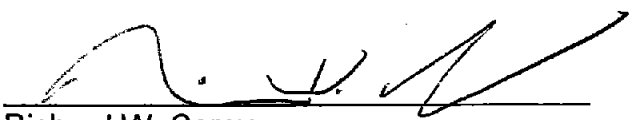
To request these special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by facsimile at (916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled Board hearing. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

Consecuente con la sección 7296.2 del Código de Gobierno de California, una acomodación especial o necesidades lingüísticas pueden ser suministradas para cualquiera de los siguientes:

- Un intérprete que esté disponible en la audiencia;
- Documentos disponibles en un formato alterno u otro idioma; o
- Una acomodación razonable relacionados con una incapacidad.

Para solicitar estas comodidades especiales o necesidades de otro idioma, por favor llame a la oficina del Consejo al (916) 322-5594 o envié un fax a (916) 322-3928 lo más pronto posible, pero no menos de 10 días de trabajo antes del día programado para la audiencia del Consejo. TTY/TDD/Personas que necesiten este servicio pueden marcar el 711 para el Servicio de Retransmisión de Mensajes de California.

CALIFORNIA AIR RESOURCES BOARD



Richard W. Corey
Executive Officer

Date: October 15, 2013

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website at www.arb.ca.gov.

State of California
AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

PROPOSED GREENHOUSE GAS (GHG) REGULATIONS FOR MEDIUM- AND HEAVY-DUTY ENGINES AND VEHICLES, OPTIONAL REDUCED EMISSION STANDARDS FOR HEAVY-DUTY ENGINES, AND AMENDMENTS TO THE TRACTOR-TRAILER GHG REGULATION, THE DIESEL-FUELED COMMERCIAL MOTOR VEHICLE IDLING RULE, AND THE HEAVY-DUTY HYBRID-ELECTRIC VEHICLES CERTIFICATION PROCEDURES



Date of Release: October 23, 2013
Scheduled for Consideration: **December 12, 2013**

State of California
AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

PROPOSED GREENHOUSE GAS (GHG) REGULATIONS FOR MEDIUM- AND HEAVY-DUTY ENGINES AND VEHICLES, OPTIONAL REDUCED EMISSION STANDARDS FOR HEAVY-DUTY ENGINES, AND AMENDMENTS TO THE TRACTOR-TRAILER GHG REGULATION, THE DIESEL- FUELED COMMERCIAL MOTOR VEHICLE IDLING RULE, AND THE HEAVY-DUTY HYBRID-ELECTRIC VEHICLES CERTIFICATION PROCEDURES

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I. Executive Summary

The Air Resources Board (ARB or Board) has developed and implements a comprehensive regulatory program to reduce emissions from on-road medium- and heavy-duty vehicles in California, to both improve air quality and reduce the emissions that contribute to climate change. This report presents five regulatory proposals that are all related to on-road medium- and heavy-duty vehicles and engines, and that are intended to help usher in new generations of lower-emitting trucks, to enhance the enforcement and implementation of existing requirements, and to establish new, optional provisions. A summary of the regulatory proposals is presented below, followed by a discussion of the expected costs and benefits, and staff's recommendation.

A. Background and Summary of Regulatory Proposals

1. New Phase 1 Greenhouse Gas (GHG) Emission Standards

In 2011, the U.S. Environmental Protection Agency (U.S. EPA) and the U.S. Department of Transportation's National Highway Traffic Safety Administration (NHTSA) jointly adopted GHG emission standards and fuel economy standards for medium- and heavy-duty engines and vehicles, informally known as the "U.S. Phase 1" GHG regulations or federal Phase 1 program. The program, which phases in between model years (MY) 2014 and 2019, establishes the first ever national GHG emission standards for medium- and heavy-duty engines and vehicles with gross vehicle weight rating (GVWR) over 8,500 pounds.

In this rulemaking action, ARB staff is proposing the adoption of new regulations that would establish GHG emission standards applicable to new vehicles, and to amend existing regulations to establish GHG standards applicable to new California medium- and heavy-duty engines. The proposed new regulations and related amendments would align California's GHG emissions standards and test procedures with those of the U.S. Phase 1 GHG regulations, provide nationwide consistency for engine and vehicle manufacturers, and allow ARB to both certify new motor vehicles and new motor vehicle engines to GHG standards and to enforce those requirements in California.

Since the 1990s, when appropriate, it has been ARB's practice to harmonize its heavy-duty vehicle emission standards with U.S. EPA's standards in order to have consistent nationwide standards given the interstate nature of the trucking industry, and this proposal continues that practice. Given California's unique air quality challenges and state mandates for aggressive GHG reductions, in the future, California may need to exercise its authority and consider heavy-duty engine and/or vehicle standards more stringent than U.S. EPA's.

In 2004, the U.S. Supreme Court clarified that the definition of standard as it applies to emissions from motor vehicles and motor vehicle engines under Title II of the federal Clean Air Act (CAA), relates to the emission characteristics of vehicles or engines and requires motor vehicles or motor vehicle engines to emit no more than a certain amount of a given pollutant, be equipped with a certain type of pollution-control device, or have some other design feature related to the control of emissions. *Engine Manufacturers Association v. South Coast Air Quality Management District* (2004) 541 U.S. 246, 253, 124 S.Ct. 1756, 1762 (*EMA*). Staff is proposing to include a definition in the proposed California Phase 1 GHG regulations to be consistent with the *EMA* court's definition of "emission standard".[1]

2. **Amendments to ARB's Existing GHG Tractor-Trailer Regulation**
In December 2008, ARB approved the Tractor-Trailer GHG regulation, which became effective January 1, 2010 (ARB, 2010). The regulation reduces the GHG emissions from long-haul tractors and trailers by improving the aerodynamic performance and reducing the tire rolling resistance of tractor-trailers. The requirements specified in the regulation are based on elements of the U.S. EPA's voluntary SmartWay program, under which manufacturers can apply to have the performance of technologies and equipment intended to reduce GHG emissions verified by U.S. EPA. Currently, the Tractor-Trailer GHG regulation requires 2011 and subsequent MY *sleeper-cab* tractors pulling 53-foot or longer box-type trailers on California highways to be SmartWay designated tractor models, and 2011 or subsequent MY *day-cab* tractors pulling 53-foot or longer box-type trailers on California highways to be equipped with SmartWay verified low rolling resistance (LRR) tires.

The proposed amendments would sunset the Tractor-Trailer GHG requirements applicable to new 2014 sleeper cab and day cab tractors and, in conjunction with the proposed adoption of the Phase 1 GHG regulations, would harmonize California's GHG standards and test procedures for new 2014 and subsequent model year California medium- and heavy-duty engines and vehicles with the emission standards and test procedures of the U.S. Phase 1 GHG regulations, but would maintain the Tractor-Trailer GHG requirements applicable to trailers and the requirements applicable to 2010 and older in-use tractors. Staff is also proposing to modify the Tractor-Trailer GHG regulation to clarify the requirements for tractors retrofitted with sleeper cab compartments.

[1] Staff is proposing to add a number of additional definitions in 13 CCR to be consistent with the EMA court's definition of "emission standard" for purposes of clarity, consistency, and conformity. The additional definitions clarify the definition of emission standard as used in title 13, CCR section 1900, the proposed Phase 1 GHG regulations, Tractor-Trailer regulation, optional NOx emission standards, and heavy-duty diesel vehicle idling ATCM.

3. **New Optional Low Oxides of Nitrogen (NOx) Emission Standards for Heavy-Duty Engines**

Since 1990, the primary oxides of nitrogen (NOx) exhaust emission standards for heavy-duty on-road engines have become dramatically more stringent, decreasing from 6.0 grams per brake horsepower-hour (g/bhp-hr) in 1990 to the current 0.2 g/bhp-hr standard, which took effect in 2010. In addition to these primary NOx standards, ARB has also established several generations of optional, lower NOx standards over the past 15 years. From 1998 to 2003, optional NOx standards ranged from 2.5 g/bhp-hr to 0.5 g/bhp-hr, in 0.5 g/bhp-hr increments, which were much lower than the primary 4.0 g/bhp-hr standard. Starting in 2004, engine manufacturers could choose to certify to optional NOx + non-methane hydrocarbon (NMHC) standards ranging from 1.8 g/bhp-hr to 0.3 g/bhp-hr, in 0.3 g/bhp-hr increments, which was significantly below the primary 2.4 g/bhp-hr NOx+NMHC standard. Such optional standards allowed local air districts and ARB to preferentially provide incentive funding to the purchasers of cleaner trucks, which encouraged the development of cleaner engines.

ARB presently does not have a mechanism in place to allow heavy-duty engine manufacturers to optionally certify engines to standards more stringent than the 2010 MY standard. Staff is therefore proposing a new regulation to establish the next generation of optional NOx emission standards for heavy-duty engines, of 0.1 g/bhp-hr, 0.05 g/bhp-hr, and 0.02 g/bhp-hr (i.e., 50 percent, 75 percent, and 90 percent lower than the current primary standard of 0.2 g/bhp-hr).

The proposed optional NOx standards will only provide emission benefits and pave the way for future cleaner engines if manufacturers choose to certify engines to such optional standards. Several existing programs such as the Carl Moyer Program and Proposition 1B Program and ARB's Truck and Bus regulation currently provide some incentives for optionally certified engines, but staff does not believe existing incentives are sufficient to encourage wide use of the optional standards. In support of staff's low-NOx proposal, potential ways in which these programs could incentivize the deployment of such trucks could include providing more Carl Moyer Voucher Incentive Program funding for optional NOx engines, and/or weighting calculated benefits for projects involving optional NOx engines to recognize the benefit of advancing low NOx technology. The upcoming evaluation of Carl Moyer policies and goals required per Assembly Bill 8 will provide an opportunity to consider how the Carl Moyer Program could support the deployment of optional low NOx-certified engines to advance future low NOx technology (AB-8, 2013).

4. **Amendments to ARB's Diesel Idling Measure**

In July 2004, ARB adopted the initial airborne toxic control measure (ATCM) to limit idling from diesel-fueled commercial motor vehicles (ARB, 2004). That

ATCM applies to diesel-fueled commercial motor vehicles including trucks and buses, with gross vehicle weight ratings (GVWRs) greater than 10,000 pounds that operate in California, and requires drivers of such vehicles to manually shut off engines that idle longer than five minutes. In October 2005, ARB adopted amendments to the idling ATCM, and related amendments to California's new heavy-duty engine emission standards and certification procedures to establish idling-based requirements on both new and in-use vehicles and engines, and off-road engines used to power alternative idling devices installed on sleeper cab equipped tractors. The proposed amendments to the idling ATCM would extend the applicability of the regulation from the driver to also include vehicle owners and motor carriers that dispatch affected vehicles, and would additionally modify the definition of "restricted area" to include schools, hotels, and motels. Restricted area is currently defined as "any real property zoned for individual or multifamily housing units, that has one or more of such units on it," and the existing ATCM prohibits idling of a main engine longer than 5 minutes or operation of a diesel-fueled auxiliary power unit longer than 5 minutes when located within 100 feet of a restricted area. The proposed amendments will ensure that emission benefits from the existing ATCM are realized by enhancing ARB's ability to enforce the ATCM, and would provide those members of the public who attend schools, or work or reside at hotels and motels additional protection from exposure to diesel particulate matter and other toxic air contaminants, and the associated potential cancer risks and other adverse health effects associated with diesel emissions.

5. **Amendments to Heavy-Duty Hybrid-Electric Vehicles Certification Procedures**

Before manufacturers can legally sell or offer for sale new engines or new vehicles in California, manufacturers must certify those engines or vehicles with ARB in accordance with ARB developed test procedures. In 2002, ARB adopted "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles in the Urban Bus and Heavy-Duty Vehicle Classes" (Interim Procedures) (ARB, 2002). The Interim Procedures were designed for heavy-duty hybrid-electric vehicle manufacturers seeking voluntary vehicle-based (as opposed to engine-based) certification.

Staff is proposing to update the Interim Procedures, to reflect the expanding commercialization and advancement of hybrid technology into more sectors of the heavy-duty market and the need to better quantify emission reductions from existing and future heavy-duty hybrid vehicles. The proposed amendments will help ensure that the test procedures are applicable to a wider range of vehicle classes and vocations, and will clarify and enhance certification requirements. The proposed amendments include expanding the applicability of the Interim Procedures to a wider range of heavy-duty vehicles, including hydraulic, turbine, flywheel, and fuel cell hybrid vehicles, and updating procedures and adding definitions to match current international

recommended practices for measuring fuel economy and emissions. The proposed amended procedures would continue to remain voluntary, interim procedures.

B. Economic Impacts

The proposed regulations and regulatory amendments will impose minimal costs on affected parties and will have minimal or no economic impacts on businesses due to the voluntary nature of the proposed adoption of the Optional Low NOx Standards and the proposed amendments to the Heavy-Duty Hybrid Electric Vehicle Certification Procedures, and due to the fact that the proposed amendments to the Tractor-Trailer GHG Regulation and to the ATCM to Limit Diesel-Fueled Commercial Motor Vehicle Idling are only directed towards clarifying existing requirements or enhancing the enforceability of existing requirements. The proposed adoption of the Phase 1 GHG regulations would impose minimal costs on affected parties because such parties would be subject to nearly identical requirements under the federal Phase 1 GHG regulations. The proposed Optional Low NOx Standards are the only element of this rulemaking proposal that could have significant new costs ($36 to 279 million, depending on the level of participation by engine manufacturers). However, the proposed Optional Low NOx standards only establish voluntary requirements and consequently would not impose costs on manufacturers that choose not to participate.

C. Environmental Impacts

ARB is the lead agency for the proposed regulations and amendments and has prepared environmental analyses pursuant to its regulatory program certified by the Secretary of the Natural Resources Agency, as in the California Code of Regulations (CCR), 14 CCR 15251(d) and 17 CCR sections 60000-60008 (CCR, 2013). In accordance with Public Resources Code section 21080.5 of the California Environmental Quality Act (CEQA), public agencies with certified regulatory programs are exempt from certain CEQA requirements, including but not limited to preparing environmental impact reports, negative declarations, and initial studies, as in 14 CCR 15250 (CCR, 2013). ARB has prepared the environmental analyses for each of the five proposed regulatory actions to assess the potential for significant adverse and beneficial environmental impacts associated with the proposed regulations/amendments, as required by ARB's certified regulatory program in 17 CCR 60005(b) (CCR, 2013). The resource areas from the CEQA Guidelines Environmental Checklist were used as a framework for assessing the potential for significant impacts, as in 17 CCR 60005(b) (CCR, 2013).

If comments received during the public review period raise significant environmental issues, staff will summarize and respond to the comments in the Final Statement of Reasons prepared for the regulations/amendments. The written responses to environmental comments will be approved prior to final action on the proposed regulations/amendments, as in 17 CCR Title 60007(a) (CCR, 2013). If the regulations/amendments are 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, as in 17 CCR 60007(b) (CCR, 2013).

The proposed regulations and regulatory amendments are designed to reduce GHG and criteria emissions from medium- and heavy-duty vehicles and engines and improve compliance with existing regulations. The proposed Phase 1 GHG regulations do not require additional compliance actions beyond those already required by the federal Phase 1 GHG regulations, hence resulting in no new direct emission benefits. The Tractor-Trailer GHG regulation is primarily being amended to harmonize with the U.S. Phase 1 GHG regulations, in conjunction with the adoption of the proposed California Phase 1 regulations. Overall, the federal Phase 1 program in California, in conjunction with the proposed amendments to sunset the requirements of the Tractor-Trailer GHG regulation applicable to new 2014 and later model year tractors, is expected to reduce 3.1 million metric tons carbon dioxide equivalent (MMTCO2e) in 2020 and 7.0 MMTCO2e in 2035, which corresponds to a 7.2 percent reduction in 2020 and 12.5 percent reduction in 2035.

Because the proposed regulation for Optional Low NOx emissions standards is optional, the emission benefits from that proposal will depend on the level of participation by engine manufacturers. Staff estimated NOx emission benefits for two different scenarios based on low and high participation rates from manufacturers and estimated NOx emission benefits of 0.6 to 1.2 tons per day (TPD) statewide in 2020, and 3.3 to 6.9 TPD in 2035.

The proposed amendments to the ATCM to limit idling from diesel-fueled commercial motor vehicles would enhance the ARB's ability to enforce the ATCM, and would help ensure that those members of the public who attend schools, or work or reside at hotels and motels are provided additional protection from exposure to diesel particulate matter and other toxic air contaminants, and the associated potential cancer risks and other adverse health effects associated with diesel emissions.

The proposed amendments to the Heavy-Duty Hybrid-Electric Vehicle Certification Procedures will provide a more comprehensive certification process and will not generate additional emissions reductions in the short-term. In the long-term, however, the amended procedures could enable more hybrid-electric vehicles to be certified and produced, which could provide emission benefits.

Based on staff's review, staff has determined that implementing the proposed regulatory actions would not result in any potentially significant adverse impacts on the environment. Each of the environmental analyses in Chapter IV of this staff report provides the basis for reaching this conclusion, in addition to a discussion of the air quality benefits expected from implementing the proposed regulations/amendments.

D. Recommendation

Because the proposed regulations and amendments will reduce GHG and NOx emissions from medium-duty and heavy-duty trucks, harmonize California requirements with federal requirements, and enhance enforcement and implementation of existing regulations, staff recommends that the Board adopt each and every one of the proposed regulatory actions described in the following chapters.

II. Introduction

The Air Resources Board (ARB or Board) has a comprehensive regulatory program in place to reduce emissions from on-road medium- and heavy-duty engines and vehicles in California. These regulatory programs are part of ARB's program to improve air quality and reduce the emissions that contribute to climate change. This report presents staff's proposal for five separate, but related regulatory actions related to on-road medium- and heavy-duty vehicles and engines. These include:

- New Phase 1 Greenhouse Gas (GHG) Emission Standards: These proposed regulations would set new GHG emissions standards for model year (MY) 2014 and later medium- and heavy-duty engines and vehicles sold in California identical to the national GHG emission standards established by U.S. Environmental Protection Agency (U.S. EPA) in 2011. This would provide California with the ability to certify engines and vehicles to the new standards as well as enforce them.

- Amendments to ARB's Existing Tractor-Trailer GHG Regulation: The proposed amendments to ARB's existing Heavy-Duty Vehicle GHG Emission Reduction regulation (Tractor-Trailer GHG regulation), in conjunction with the proposed new Phase 1 GHG regulations described above, would harmonize California's GHG standards and test procedures for new 2014 and subsequent model year California medium- and heavy-duty engines and vehicles with the emission standards and test procedures of the U.S. Phase 1 GHG regulations, but would maintain the Tractor-Trailer GHG requirements applicable to trailers and the requirements applicable to 2010 and older in-use tractors. Staff is also proposing to modify the Tractor-Trailer GHG regulation to clarify the requirements for tractors retrofitted with sleeper cab compartments.

- New Optional Low Oxides of Nitrogen (NOx) Emission Standards for Heavy-Duty Engines: ARB presently does not have a mechanism in place to allow heavy-duty engine manufacturers to optionally certify engines to standards more stringent than the 2010 MY standard. Staff is therefore proposing a new regulation to establish the next generation of optional NOx emission standards for heavy-duty engines, of 0.1 g/bhp-hr, 0.05 g/bhp-hr, and 0.02 g/bhp-hr (i.e., 50 percent, 75 percent, and 90% lower than the current primary standard of 0.2 g/bhp-hr). The proposed optional standards for NOx could serve to encourage development of new, cleaner engines.

- Amendments to ARB's ATCM to Limit Diesel Idling: The proposed amendments to ARB's existing airborne toxic control measure to Limit Diesel-fueled Commercial Motor Vehicle Idling (idling ATCM) would extend the applicability of the ATCM to include vehicle owners and motor carriers in addition to drivers. The proposed amendments would also modify the definition of "restricted area" to include schools, hotels, and motels.

- Amendments to ARB's Heavy-Duty Hybrid-Electric Vehicles Certification Procedures: The proposed amendments would update ARB's Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes, originally adopted by ARB in 2002. These amendments are intended to make the certification procedures more broadly applicable to additional vocational vehicles (VVs) and heavy-duty plug-in hybrid electric vehicles that have entered the market since the regulation was originally adopted. The amended procedures would remain voluntary, interim procedures.

  In 2004, the U.S. Supreme Court clarified the definition of standard as it applies to emissions from motor vehicles and motor vehicle engines under Title II of the federal Clean Air Act (CAA). *Engine Manufacturers Association v. South Coast Air Quality Management District* (2004) 541 U.S. 246, 253, 124 S.Ct. 1756, 1762 (*EMA*, 2004). Staff is proposing to add a number of additional definitions of "emission standard" in 13 CCR to be consistent with the *EMA* court's definition of standard for purposes of clarity, consistency, and conformity. The additional definitions clarify that the definitions of emission standard as used in title 13, CCR section 1900, the proposed Phase 1 GHG regulations, Tractor-Trailer GHG regulation, optional NOx emission standards, and idling ATCM conform to the federal definition.

A. Need for Emission Reductions and Regulatory Authority

These regulatory proposals collectively affect the medium- and heavy-duty vehicles (trucks) category, which includes all vehicles greater than 8,500 pounds gross vehicle weight rating (GVWR). They affect trucks ranging from Class 2 full-size pickup trucks and utility vans weighing just over 8,500 pounds all the way up to Class 8 heavy-duty vehicles with a GVWR of more than 80,000 pounds. Each

of the five proposed regulations affects a different class of vehicles as is detailed in the Proposed Regulations and Amendments chapter of this report.

The truck category is a significant source of NOx, particulate matter (PM), and GHG emissions in California. According to ARB's emission inventory, medium- and heavy-duty trucks (>8,500 pounds GVWR, all fuel types) emit about 69 percent of the NOx emissions from on-road vehicles and about 32 percent of the NOx emissions from all sources in California in 2013. Similarly, medium- and heavy-duty trucks emit 38 percent of the PM emissions from on-road vehicles and about 2 percent of the PM emissions from all sources in California in 2013.

For GHG emissions, heavy-duty trucks, buses, and motor homes emitted 23 percent of the GHG emissions from on-road vehicles and 8 percent of the GHG emissions from all sources in California in 2010 (ARB, 2013a). Reducing emissions from trucks is an important part of ARB's programs to meet the heath based ambient air quality standards, reduce the toxic risk from exposure to diesel PM, and reduce the GHG emissions that contribute to climate change.

1. **Ambient Air Quality Standards**
   Under California and federal law, ARB is the primary agency in California responsible for ensuring that all regions of California attain and maintain the state and federal ambient air quality standards (FCA, 2004). To achieve this, California must adopt all feasible measures to obtain the necessary emission reductions, including measures for mobile sources (HSC, 2013).

   As discussed further below, the medium- and heavy-duty vehicles covered by these regulatory proposals are major sources of NOx and PM emissions in California. They also emit reactive organic gases and carbon monoxide (CO).

   Emissions from medium- and heavy-duty vehicles contribute to violations of the health based ambient air quality standards for ozone and PM. Meeting these ambient air quality standards remains a challenge particularly in the South Coast and San Joaquin Valley Air Basins – the two parts of California with the worst air quality. State Implementation Plans (SIP) for these regions show the need for significant NOx reductions from long-term measures (beyond the specific near-term measures identified in the SIP) to meet U.S. EPA's 1997 8-hour ozone standard by 2023. These long-term NOx SIP commitments are 241 tons per day for the South Coast and 81 tons per day for the San Joaquin Valley (ARB, 2009). These regions will need even greater emission reductions to meet U.S. EPA's more stringent 2008 8-hour ozone standard by 2032 as shown in ARB's 2012 Vision for Clean Air: A Framework for Air Quality and Climate Planning study (ARB, 2012a). This package of proposed regulations would continue reducing truck emissions, helping California make progress toward attaining the ambient air quality standards.

2. Climate Change

The California Global Warming Solutions Act of 2006, Assembly Bill (AB) 32, established requirements for a comprehensive program to reduce GHG emissions. AB 32 gives ARB responsibility for monitoring and reducing GHG emissions. It requires ARB and other state agencies to adopt regulations and other requirements that would reduce statewide GHG emission levels to 1990 levels by 2020 and to maintain and continue reductions beyond 2020. Further, Governor's Executive Order S-3-05 directed that GHG emission levels be reduced to 80 percent below 1990 levels by 2050, and Governor Brown's Executive Order B-16-12 reaffirmed a 2050 GHG emission reduction target for the transportation sector of 80 percent below 1990 levels.

AB 32 requires ARB to identify a list of "discrete early action greenhouse gas reduction measures" to be adopted by 2010 and to develop and approve a Scoping Plan that describes the approach California will take to reduce GHGs to achieve the goal of reducing emissions to 1990 levels by 2020. The Tractor-Trailer regulation was an AB 32 discrete early action measure. The initial Scoping Plan was developed by ARB in 2008 and, per AB 32, must be updated every five years to evaluate the mix of AB 32 policies to ensure that California is on track to achieve the 2020 GHG reduction goal. ARB is in the process of developing the 2013 Update to the Climate Change Scoping Plan. The 2013 Update will highlight California's progress toward meeting the 2020 GHG emission reduction goals defined in the 2008 Scoping Plan as well as define ARB's climate change priorities for the next five years. The 2013 Update will also lay the groundwork to start the transition to the post-2020 goals set forth in Executive Orders S-3-05 and B-16-2012.

Meeting the 80 percent emission reduction target for 2050 will require California to steadily drive down emissions from every sector. Staff's proposed Phase 1 regulations and the Tractor-Trailer GHG regulation as proposed to be amended would provide GHG emission reductions that help California meet these targets.

3. Diesel Risk Reduction

Under California law, ARB is also responsible for controlling toxic air contaminants (TAC). This includes adopting emission standards for motor vehicles to achieve the maximum possible reduction in public exposure to TACs (HSC, 2013).

In 1998, California identified diesel PM as a TAC. Diesel PM has been found to contain over 40 substances that are individually identified as TACs and is associated with increases in lung diseases, heart disease, mortality, and other chronic non-cancer health effects. In 2000, ARB approved the Diesel Risk Reduction Plan which identified the impacts of diesel PM, identified technologies to control diesel PM, and outlined measures necessary to reduce diesel PM by 75 percent by 2010 and 85 percent by 2020.

ARB subsequently adopted a series of regulations to reduce the health risk from exposure to diesel exhaust, which include ARB's idling ATCM.

B. Existing Emission Standards and Programs

1. New Engine Emission Standards

Table 1 below shows the current California emission standards for new on-road heavy-duty diesel engines (HDDE) as contained in the 13 CCR 1956.8 (CCR, 2013).

Table 1 – Current MY 2013 HDDE Emission Standards (in grams per brake-horsepower hour (g/bhp-hr))

Emission Standards	
NOx	0.2
PM	0.01
NMHC	0.14

The PM emission standards took effect in the 2007 heavy-duty engine MY. The NO_x and non-methane hydrocarbon (NMHC) standards were phased in for diesel engines between 2007 and 2010.

California does not currently have GHG emission standards for heavy-duty diesel or Otto cycle (spark-ignited) engines. The Phase GHG 1 standards proposed in this regulatory proposal document would be the first such standards.

2. U.S. EPA SmartWay Program

Launched in 2004, SmartWay® is a voluntary U.S. EPA program with the goal of reducing transportation-related emissions by creating incentives to improve supply chain fuel efficiency. In addition to ranking vehicles by their environmental performance, providing grants for fuel-saving equipment, and allowing freight companies to commit to lower fuel consumption, under the SmartWay program, U.S. EPA establishes performance criteria and reviews test data to ensure that designated tractor and trailer models have been demonstrated to be more fuel efficient than their traditional counterparts. The SmartWay program also verifies the performance of individual aerodynamic equipment for trailers and low-rolling resistance tires for tractors and trailers.

C. Emissions from Medium- and Heavy-Duty Vehicles

As noted above, these regulatory proposals collectively affect the medium- and heavy-duty vehicles (trucks) category, which includes vehicles greater than 8,500 pounds GVWR. Figure 1 shows the classes of vehicles covered by these regulations. There are differences in the classes of vehicles covered by the five proposed regulations or amendments, as detailed in the Proposed Regulations and Amendments chapter of this report. However, this section provides background on the emissions from the entire category.

Figure 1 - Medium- and Heavy-Duty Vehicle Classes

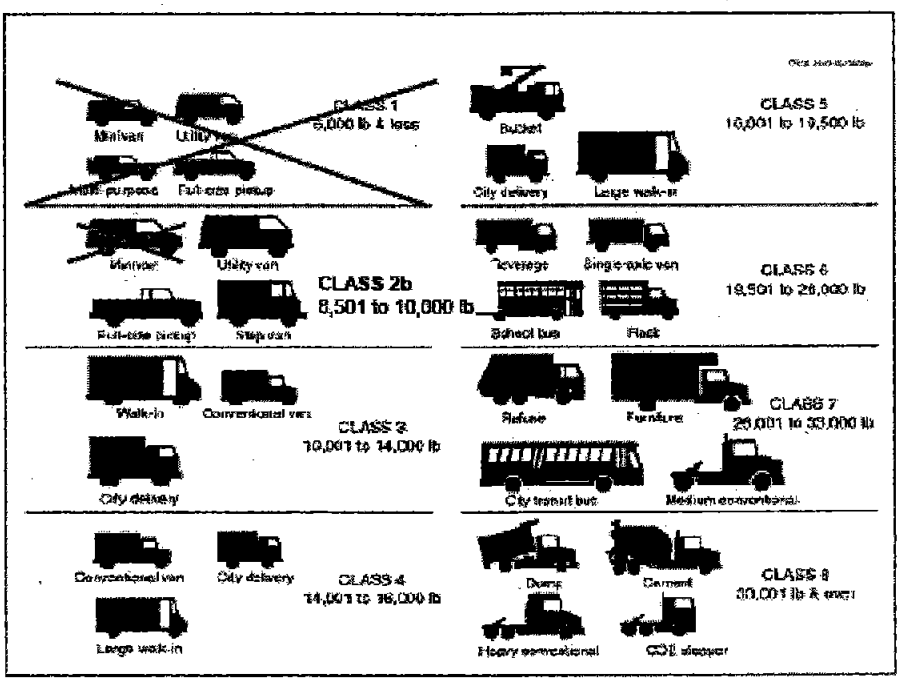


Table 2 shows the baseline NOx, PM, and carbon dioxide (CO2) emissions from these vehicles.

Table 2 - Baseline California Emissions from Trucks Greater Than 8,500 pounds GVWR
(In tons per day for NOx and PM, million metric tons (MMT) per day for CO2)

Pollutant	2013	2020	2035
NOx	686.5	405	288
PM (<10μm)	28.7	20.5	24.6
PM (<2.5μm)	20.2	11.6	13.5
CO2 (MMT per Day)	39.5	43.2	55.5

- Data are obtained from Emission Factors (model) (EMFAC) 2011 web tool (ARB, 2013e)
- Emissions includes **PTO** (power takeoff)

Diesel-cycle engines use a compression-ignition system to initiate combustion of the fuel in the engine's combustion chamber. Thus, a diesel-fueled engine does

not need an ignition source (e.g., spark plug) to ignite the air/fuel mixture. By contrast, natural gas and liquefied petroleum gas-fueled engines are also typically diesel-cycle engines (having relatively high compression) but do require an ignition source (e.g., a glow plug along with a small amount of diesel fuel injected into the cylinder) to ignite the air/fuel mixture. However, regardless of how the air/fuel mixture is ignited, if engines are derived from diesel-cycle engines,[2] they would, for the purpose of this rulemaking, be considered HDDEs.

Vehicles with HDDEs are segregated into weight classes for regulatory and emissions inventory purposes, as shown in Table 3.[3] The definition of light heavy-duty vehicle used in California regulations differs from that used in federal regulations, as shown in Table 3. In California, vehicles with a GVWR between 8,501 and 14,000 pounds are considered medium-duty vehicles and may optionally use engines certified to heavy-duty engine standards or may certify to the low-emission vehicle (LEV) standards.[4] Because the majority of this staff report concerns adopting California's Phase 1 GHG regulations that would establish GHG emission standards that are identical to those in the U.S. Phase 1 GHG emission standards, we use the federal weight classifications for light heavy-duty (LHD), medium heavy-duty (MHD), and heavy heavy-duty (HHD) vehicles for the remainder of this staff report.[5]

Table 3- Federal and ARB Heavy-duty Truck Weight Classes

GVWR (pounds)	8,501-10,000	10,001-14,000	14,001-16,000	16,001-19,500	19,501-26,000	26,001-33,000	33,001+
Federal	Light heavy-duty				Medium heavy-duty		Heavy heavy-duty
California (1995 and later model year)[5]	Medium-duty		Light heavy-duty		Medium heavy-duty		Heavy heavy-duty

[2] HDDE emission standards are optional for engines used in medium-duty vehicles 8,501 to 14,000 pounds GVWR, pursuant to the LEV requirements in title 13, CCR, Section 1961.

[3] Title 13, CCR, Section 1900 defines heavy-duty vehicle as any motor vehicle other than a passenger car having a GVWR greater than 6,000 pounds. However, for the purposes of this staff report, heavy-duty is used to mean a vehicle with a GVWR greater than 8,500 pounds.

[4] Note that for the 2020 and subsequent MYs, medium-duty vehicles 8,501-14,000 pounds GVWR must certify to LEV III chassis standards.

[5] For emissions inventory purposes, ARB's EMFAC model defines LHD and MHD differently than shown in Table 3. EMFAC defines light heavy-duty as 8,501 to 14,000 pounds GVWR, and medium heavy-duty as 14,001 to 33,000 pounds GVWR. The EMFAC definitions are not used in the body of this staff report; instead, this staff report uses the federal weight classifications for LHD, MHD, and HHD vehicles.

Most of the emissions from heavy-duty trucks come from diesel-cycle compression ignition engines, especially in the higher weight classes. However, vehicles with gasoline and natural gas spark-ignited engines are also part of the truck fleet, particularly in the lower weight classifications shown above. The characteristics of the fleet of heavy-duty vehicles on California's roads vary depending on the weight ranges of the vehicles, as follows:

- GVWR 8,500-14,000 pounds (low end of LHD): Approximately two thirds of vehicles in this weight range are spark-ignited, and one third diesel-powered. However, two thirds of the NOx and PM emissions from vehicles in this weight range come from diesel-powered vehicles. Only a small percentage of such vehicles are spark-ignited.
- GVWR 14,001-33,000 pounds (high end of LHD and all MHD): These heavier trucks are predominantly diesel-powered (about 80 percent by population run on diesel). Their NOx and PM emissions are dominated by emissions from the diesel-powered fraction. Only a small percentage of such vehicles are spark-ignited.
- GVWR over 33,000 pounds and up (HHD): Nearly all of these heaviest of the heavy-duty trucks are diesel-powered (98 percent by population), and the non-diesel portion has only negligible NOx and PM emissions.

The primary pollutants of concern from diesel engines are NOx and PM, since both are harmful to human health. The high combustion and exhaust temperatures and excess air cause the nitrogen in the air to combine with available oxygen to form NOx. Since diesel-cycle combustion operates with excess air, gaseous by-products due to incomplete combustion are emitted at relatively low levels. These by-products include hydrocarbon (HC) and CO. The incomplete combustion of a diesel-cycle engine does however contribute to relatively high levels of PM (compared to Otto-cycle stoichiometric, or spark ignited, engines). Lubrication oil entering the combustion chamber also contributes to overall PM emissions. Evaporative emissions from diesel engines are not significant since diesel fuel has a low vapor pressure and thus, a low evaporation rate.

Natural gas, which consists largely of methane (CH4) formed underground through the decay of buried dead plants and animals, is considered a relatively clean fossil fuel because it does not contain mercury, has very little sulfur, and has a low carbon footprint compared to coal and petroleum. Natural gas is typically used as liquefied natural gas (LNG) or compressed natural gas (CNG). Although traditionally, as discussed above, heavy-duty trucks have largely been powered by diesel fuel, in recent years due to the current low prices of natural gas as compared to diesel fuel, more natural gas powered heavy-duty truck engines have become available (Smith, 2012).

The primary criteria pollutant of concern for natural gas-powered heavy-duty truck engines is NOx. However, it is generally easier to achieve low NOx emissions from a natural gas engine versus a diesel engine. Although the

newest diesel engines can meet the same NOx standards as natural gas engines, to meet the current standards, diesel engines require relatively complex emission control equipment such as a selective catalytic reduction (SCR) system with diesel exhaust fluid. Spark-ignition natural gas engines on the other hand can meet the same NOx emission standards with a basic catalytic converter (Wisconsin, 2013).

Spark-ignition engines such as natural gas engines typically have slightly lower efficiency than compression-ignition engines such as diesel engines. Hence, natural gas engines have slightly poorer fuel economy and slightly higher NMHC and carbon dioxide (CO2) tailpipe emissions, compared to diesel engines.

D. Stakeholder Participation in Developing Proposals

On March 11, 2013, ARB staff (staff) held a public workshop in Sacramento to discuss four of the five heavy-duty vehicle regulatory proposals: the Phase 1 regulations, the optional low NOx standards, amendments to the Tractor-Trailer GHG regulation, and amendments to the idling ATCM. The workshop was webcast as well. In addition to this workshop, staff held meetings with interested stakeholders. Staff also followed up by providing an early review version of the draft regulatory language for the Phase 1 regulations and the optional low NOx standards in August 2013 to those who had attended the public workshop (because the regulatory language had not been drafted at the time of the workshop).

The public outreach for the proposed amendments to the heavy-duty hybrid electric vehicle certification procedures proceeded on a separate time line from the other four proposals. Staff held two public workshops in Sacramento on February 3, 2010 and August 30, 2012. Both these workshops were webcast as well. Staff also convened a public working group to discuss the proposals in greater detail and held two working group meetings via conference calls on February 26, 2013 and March 19, 2013. In addition to these meetings, staff held meetings with interested stakeholders. Staff also followed up by providing an early review version of the draft regulatory language for the amended certification procedures in July 2013 to selected stakeholders and held teleconference discussions with some of them in August 2013.

The remainder of this report is organized as follows:

- Chapter III summarizes staff's recommendation for Board action.
- Chapter IV contains a section for each proposed regulation or regulatory amendment, providing the background, a summary of the proposed requirements or amendments, as well as a discussion of technological feasibility, environmental impacts, cost, and regulatory alternatives that were considered.
- Chapter V summarizes the cost and economic impacts for all five regulatory proposals.
- Chapter VI summarizes the environmental impacts for all five regulatory proposals.
- Chapter VII summarizes the environmental justice impacts of all five regulatory proposals.
- Chapter VIII defines acronyms and abbreviations used.
- Chapter IX lists references used.

III. Summary of Recommended Board Action

Staff recommends that the Board approve for adoption the proposed regulations and regulatory amendments included in Appendix I and described in the chapters below. Approving the adoption of the proposed regulations and amendments will reduce emissions of GHG and NOx from medium- and heavy-duty trucks, help to harmonize California requirements with federal requirements, and ease enforcement and implementation of existing medium- and heavy-duty truck regulations.

IV. Proposed Regulations and Amendments

Section A below discusses the proposed Phase 1 regulations. Section B discusses the proposed amendments to ARB's existing GHG Tractor-Trailer regulation. Section C describes the proposed new Optional Low NOx Emission Standards for Heavy-Duty Engines. Section D discusses the proposed amendments to ARB's idling ATCM. Section E describes the proposed amendments to ARB's Heavy-Duty Hybrid-Electric Vehicles Certification Procedures.

A. Phase 1 GHG Emission Standards (New Proposal)

Staff is proposing to align California's medium- and heavy-duty vehicle and engine regulations with U.S. EPA's Phase 1 program by adopting new California emission standards and test procedures identical to those adopted by U.S. EPA. This would provide California with the ability to certify engines and vehicles to the Phase 1 standards and allow ARB to enforce the requirements in California. The text of the proposed emission standards and test procedures is contained in Appendix I.A.

1. Background

In 2011, U.S. EPA and the U.S. Department of Transportation's National Highway Traffic Safety Administration (NHTSA) jointly adopted GHG emission

standards and fuel economy standards for medium- and heavy-duty engines and vehicles. These standards are informally known as the "U.S. Phase 1" GHG program (or federal Phase 1 regulations) in anticipation of a second round of rulemaking by U.S. EPA scheduled for completion in 2015 (informally known as "U.S. Phase 2 GHG" regulation). The U.S. EPA Phase 1 GHG regulations, which phase in between MYs 2014 and 2018, are the first ever national GHG emission standards for medium- and heavy-duty engines and vehicles.[6] The U.S. EPA Phase 1 GHG regulations will reduce GHG emissions from heavy-duty engines and vehicles by establishing emission standards for CO2 and other GHGs (nitrous oxide (N2O), methane (CH4), and hydrofluorocarbons (HFC)) resulting in more efficient, lower emitting engines and vehicles. The complementary NHTSA fuel economy standards will also reduce fuel use from the medium- and heavy-duty vehicle fleet improving energy security and reducing transportation costs.

In this rulemaking, staff is proposing to align California's medium- and heavy-duty vehicle and engine regulations with U.S. EPA's Phase 1 GHG regulations by adopting new California emission standards and test procedures identical to those adopted by U.S. EPA. This would provide California with the ability to certify engines and vehicles to the Phase 1 GHG standards and allow ARB to enforce the requirements in California (ARB, 2013f). It would also provide nationwide consistency for the heavy-duty truck and engine manufacturers.

When U.S. EPA adopted the U.S. Phase 1 GHG standards, it anticipated that ARB would subsequently adopt the same standards (U.S. EPA, 2011a). It has been standard practice since the 1990s for ARB to harmonize its heavy-duty vehicle emission standards with U.S. EPA's standards in order to have consistent nationwide standards given the interstate nature of the trucking industry[7]. In 1997, U.S. EPA adopted new emission standards for 2004 and subsequent heavy-duty diesel engines, and ARB adopted matching California standards in 1998. Similarly, U.S. EPA adopted emission standards for 2007 and subsequent heavy-duty diesel engines in 2001, and ARB followed suit harmonizing California's standards later the same year (ARB, 2001). This proposal would continue that practice.

The proposed Phase 1 GHG regulations would complement ARB's existing Tractor-Trailer GHG regulation for heavy-duty vehicles, which was adopted by the Board in 2008 and amended in 2010. As discussed further in Section B

[6] The U.S. EPA Phase 1 GHG regulations contain provisions allowing manufacturers the option to certify 2013 model year engines and vehicles to the GHG standards to obtain emissions credits. 40 CFR 1036.150(e) and 40 CFR 1037.150(a), respectively.

[7] It is ARB staff's goal to continue the practice of harmonizing with U.S. EPA's standards. In the future, however, due to California's unique air quality challenges and state mandates for aggressive GHG reductions, staff may propose that California adopt heavy-duty engine and/or vehicle standards more stringent than U.S. EPA's.

below, ARB's existing Tractor-Trailer GHG regulation requires new and existing long-haul tractors pulling 53-foot or longer box-type trailers and 53-foot and longer box-type trailers operating on California highways to be equipped with U.S. EPA SmartWay approved aerodynamic technologies and low-rolling resistance tires. The voluntary U.S. EPA SmartWay Partnership Program certifies tractors and trailers that have been demonstrated to be more fuel efficient than their traditional counterparts.

The Phase 1 GHG regulations partially overlap with the Tractor-Trailer GHG regulation because they set emission standards for the tractors covered by the Tractor-Trailer GHG regulation. However, unlike ARB's Tractor-Trailer GHG regulation, the U.S. Phase 1 regulations do not regulate trailers. As described in greater detail below in Section B, staff is proposing to amend the the Tractor-Trailer GHG regulation (with no amendments to the trailer portion of the regulation) in conjunction with the proposed adoption of the Phase 1 GHG regulations to ensure that California's GHG requirements are consistent with the U.S. Phase 1 GHG requirements.

2. Summary of Proposed Regulation Requirements and Deadlines

a. Proposed Regulation Overview

The intent of the proposed regulations is to harmonize with U.S. EPA's Phase 1 GHG program by adopting the same federal GHG emissions standards in California for medium- and heavy-duty engines and vehicles. The federal program is designed to reduce GHG emissions by establishing CO2, CH4, N2O, and HFC standards for new engines and vehicles (U.S. EPA, 2011e). Staff proposes to align with federal standards that begin with MY 2014, and increase in stringency through 2019. There are separate engine standards for compression-ignition versus spark-ignition engines. Vehicle standards are established within three regulatory categories: Class 7 and 8 tractor-trailers,[8] Class 2b to 8 VVs, and Class 2b and 3 pickup trucks and vans (PUV). Additionally, U.S. EPA has provided regulated entities with a variety of compliance methods and credit opportunities, including an alternative compliance path that starts in 2013, an opportunity to average, bank, and trade credits, as well as recognition of advanced technologies and early credits. Staff is proposing to maintain the same compliance flexibility as in the federal program to minimize manufacturers' compliance burden. Thus, staff's proposal would recognize those manufacturers that comply with the federal Phase 1 GHG program (Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles published in 40 Code of Federal Regulations (CFR) Parts 86, 1036, 1037, 1065, and

[8] In some of U.S. EPA 's Phase 1 GHG rulemaking materials, U.S. EPA uses the term "HD Tractor-Trailer" to mean a class 7 or class 8 motor vehicle designed to pull a semitrailer on a highway. For consistency with ARB's Tractor-Trailer GHG regulation, this staff report uses the term "tractor-trailer" for that purpose.

1066, dated July 2013), as "deemed to comply" with the California standards (U.S. EPA, 2013a; U.S. EPA, 2013b). This will enable manufacturers to pursue one compliance strategy to meet both the federal and California requirements.

b. Applicability

The proposed rulemaking applies to motor vehicles with a GVWR of 8,500 pounds or greater, and the engines that power them, except for medium-duty passenger vehicles already covered by ARB's LEV program.

Staff is proposing that the applicability of the Phase 1 GHG requirements be identical to the U.S. Phase 1 GHG program. The federal Phase 1 GHG program applies to all businesses that manufacture, sell, or import new heavy-duty and medium-duty engines, incomplete and complete vehicles including new Class 2b through 8 vehicles, trucks, tractors, school and transit buses, VVs such as utility service trucks, and three-quarter ton and 1-ton PUVs. Staff is proposing that the Phase 1 GHG regulations apply to the same medium- and heavy-duty sector effective with 2014 MY engines and vehicles.

c. Requirements and Compliance Deadlines

Staff is proposing to establish California GHG standards identical to those in the federal Phase 1 program, including standards for CO2, CH4, N2O, and HFC emissions, to create a nationally harmonized program. Federal GHG standards are established separately for diesel and gasoline engines, with different stringency points and effective dates. The GHG standards are also separately established for three distinct regulatory vehicle classes: tractor-trailers, VVs, and heavy-duty PUVs. U.S. EPA's GHG engine and vehicle standards generally begin with MY 2014 engines and increase in stringency through 2019.

i. CH4 and N2O Engine and Vehicle Standards

Staff is proposing to adopt engine and vehicle standards for N2O and CH4 that are equivalent to those of the federal Phase 1 GHG program. The Phase 1 GHG standards include CH4 and N2O limits applicable only to engines and PUV vehicles. There are no separate CH4 or N2O standards for tractor-trailers or VVs since the standards will already apply to the engines used in these vehicles. U.S. EPA's CH4 and N2O standards are intended to function as a cap, and are not intended to reduce emissions beyond today's levels (U.S. EPA, 2011b). The federal standards help to ensure that manufacturers do not employ GHG emission reduction technologies that increase the current amount of emissions (ibid). U.S. EPA's Phase 1 GHG standards require that medium- and heavy-duty engines meet a N2O and CH4 engine emission standard that does not exceed 0.10 g/bhp-hr for N2O and 0.10 g/bhp-hr for CH4 for the applicable useful life of the engine. For

diesel engines, the N2O and CH4 standards apply to 2014 and subsequent MYs. Separately, for spark-ignited engines (i.e., gasoline and other engines derived from gasoline engines, such as natural gas engine derived from gasoline engines), the N2O and CH4 standards apply to 2016 and subsequent MY engines. For PUVs, the CH4 and N2O standards apply to MY 2014 and subsequent vehicles. The N2O standard for PUVs is 0.05 g/mile, and the CH4 vehicle standard is 0.05 g/mile. As described further in 13 CFR 1036.705(d) and 1037.104(c), manufacturers may apply CO2 emission credits to meet CH4 and N2O standards, if needed (CFR, 2013).

ii. HFC Refrigerant Vehicle Standards

To address vehicle-based GHG emissions released from air conditioning (a/c) systems caused by the extra load placed on the engine to provide power for the a/c system (as discussed in paragraph iii below), and by refrigerant leakage, U.S. EPA established HFC refrigerant standards (U.S. EPA, 2011b). Specifically, to address refrigerant leakage, manufacturers are required to meet a low leakage rate for a/c systems installed in 2014 MY and subsequent PUV and tractor-trailer vehicle classes. As further explained in the Federal Register, there are no leakage standards established for Class 2b to 8 VVs because of the numerous parties that are involved in the production and installation of the a/c system. For a/c systems with a refrigerant capacity greater than 733 grams, staff is proposing to match U.S. EPA's standard of a 1.5 percent leakage rate per year. Staff is proposing to also adopt U.S. EPA's final standard of 11.0 grams per year for a/c systems with a refrigerant capacity of 733 grams or less.

iii. CO2 Vehicle Standards

Staff is proposing to use the same metrics as U.S. EPA for CO2 vehicle standards. For PUVs, U.S. EPA finalized a standard based on grams of CO2 emitted per mile travelled (g/mile), consistent with the current metric used for criteria pollutant requirements for these vehicles (U.S. EPA, 2011f). For tractor-trailers and VVs, U.S. EPA's final standards are expressed as the mass of emissions from carrying a ton of cargo over a distance of one mile (g/ton-mile). In other words, the unit is expressed as a measure of freight movement or tons of payload miles travelled (U.S. EPA, 2011h).

1. Class 7 and 8 Tractor-Trailer CO2 Standards

The U.S. Phase 1 GHG standards for tractor-trailers are based on several key attributes related to GHG emissions: the vehicle's GVWR, the roof height of the cab, and associated day cab or sleeper cab characteristics. U.S. EPA finalized two sets of CO2 standards for class 7 and 8 tractor-trailers. In addition to vehicle-based standards, as discussed further in section iv below, there are

separate performance standards for the engines manufactured for use in these tractors. Tractor/truck manufacturers are required to install the appropriate certified engine in their vehicle. That is, a VV engine must be used in a VV, and an engine designed for tractors may only be used in tractor vehicles. To harmonize California's program with the U.S. Phase 1 GHG program, staff is proposing to establish the same concept of two separate standards for tractor-trailers: one set of vehicle-based standards and one set of engine standards for engines used in these tractors.

U.S. EPA created nine subcategories for Class 7 and 8 tractor-trailers to recognize the differences in expected emissions associated with the various tractor cab attributes (U.S. EPA, 2011b). To align with U.S. EPA requirements, staff proposes to adopt these same nine subcategories. As shown in Table 4, the proposed standards would begin with vehicles produced for the 2014 MY and then become more stringent for 2017 and subsequent MYs.

Table 4 - Proposed CO2 Standards for Class 7 and 8 HD Tractor-Trailers

HD Tractor-Trailer Vehicle Standards (gCO2/ton-mile)						
	2014-2016 MY			2017 MY and beyond		
	Class 7	Class 8		Class 7	Class 8	
		Day Cab	Sleeper Berth		Day Cab	Sleeper Berth
Low Roof	107	81	68	104	80	66
Mid Roof	119	88	76	115	86	73
High Roof	124	92	75	120	89	72

2. Class 2b through Class 8 VVs CO2 Standards

The U.S. Phase 1 GHG program establishes CO2 standards for VVs that fall within three regulatory subcategories, distinguished by GVWR: LHD vehicles that range from 8,500 to 19,500 pounds, MHD vehicles that range from 19,501 to 33,000 pounds, and HHD vehicles with a GVWR of 33,001 pounds and above. These three groupings were established by U.S. EPA to maintain consistency with the same breakdown of weight classes used for engine

standards. Examples of VVs include delivery, refuse, cement, and tow trucks, as well as transit, shuttle and school buses, motor homes, and recreational vehicles. All medium- and heavy-duty vehicles not covered by the tractor-trailer or PUV regulatory classes are to be considered VVs. U.S. EPA has established separate standards for the engines used in Class 2b through 8 VVs, as described further in section iv below. Chassis manufacturers are required to install certified engines in their chassis. The federal Phase 1 program explicitly regulates the chassis manufacturers and not the body builders of VVs. To align with U.S. EPA's program, staff is proposing to adopt identical California standards for chassis manufacturers. As shown in Table 5, proposed standards would begin with VVs produced for the 2014 MY and then become more stringent for 2017 and subsequent MYs.

Table 5 - Proposed CO2 Standards for Class 2b to 8 Vocational Vehicles

Vocational Vehicle CO2 Standard (gCO2/ton-mile)			
	LHD Class 2b-5	**MHD Class 6-7**	**HHD Class 8**
2014-2016 MY	388	234	226
2017 MY and beyond	373	225	222

3. **Class 2b to 3 PUVs CO2 Standards**
To create a harmonized national program, staff is also proposing to adopt the federal standards established for medium- and heavy-duty vehicles with a GVWR between 8,501 pounds and 14,000 pounds (i.e., PUVs). Examples of PUVs are three-quarter ton and 1-ton pickup trucks, 12- and 15-passenger vans, and large work vans, while medium-duty passenger vehicles are excluded from this category. Unlike the separate engine and vehicle standards established for VVs and tractor-trailers (as discussed in subsection iv below), PUVs are required to meet a combined vehicle/engine, or "whole-vehicle" standard. As explained in the Federal Register, U.S. EPA finds that approximately 90 percent of PUVs are sold by manufacturers as complete vehicles (U.S. EPA, 2011b). Additionally, the technologies used for this segment of the market are similar to light-duty vehicles that require both engine and vehicle efficiency improvements to significantly reduce GHG emissions (ibid). Therefore, establishing a whole-vehicle based standard for PUVs is appropriate, and staff is proposing to adopt the same approach.

Each vehicle manufacturer must meet the PUV standards on a fleet average basis for its entire produced fleet. As described further in

Appendix II, the individual fleet average targets for each engine family vary based on several factors, including whether the vehicle is gasoline- or diesel-fueled, and its payload and towing capabilities.

iv. GHG Standards for Heavy-Duty Engines

In addition to creating GHG heavy-duty vehicle standards, the U.S. Phase 1 GHG program also establishes GHG standards for medium- and heavy-duty engines used in those vehicles. The standards differ for gasoline and diesel engines, with gasoline engine standards effective beginning with the 2016 MY, and diesel engine standards effective beginning with the 2014 MY and increasing in stringency through 2017 (Natural gas engines derived from gasoline engines must comply with the gasoline engine standards, and those derived from diesel engines must comply with the diesel engine standards. (U.S. EPA, 2011g)) As described in 40 CFR 1036.140, U.S. EPA is using the existing four service classes (three for diesel engines and one for gasoline engines), currently established for criteria pollutant emission regulations to define engine subcategories. To align with the U.S. Phase 1 GHG regulations, staff is proposing to adopt the same medium- and heavy-duty engine standards for the four prescribed regulatory engine classes, shown in Table 6, to ensure that the proper engine is installed in the vehicle for which it is designed.

Table 6 - Proposed Engine Service Classes

Engine category	Intended application
Light Heavy-duty (LHD) Diesel.	Class 2b through Class 5 trucks (8,501 through 19,500 pounds GVWR).
Medium Heavy-duty (MHD) Diesel.	Class 6 and Class 7 trucks (19,501 through 33,000 pounds GVWR).
Heavy Heavy-duty (HHD) Diesel.	Class 8 trucks (33,001 pounds and greater GVWR.
Gasoline	Incomplete vehicles less than 14,000 pounds GVWR and all vehicles (complete or incomplete) greater than 14,000 pounds GVWR.

All medium- and heavy-duty engines of a manufacturer's produced fleet may be grouped together into subfleets, if they have similar engine and emission components throughout their useful life in accordance with 40 CFR 86.24 (CFR, 2013). Hybrid engines and hybrid powertrains must be grouped together as a fleet of hybrid engines. Additionally, MHD and HHD diesel engines designed specifically for use in either tractor-trailer or VV functions are to be

grouped together based on their intended application. Staff intends to keep U.S. EPA's subgroup definitions to ensure that the proposed CO2 engine standards apply to the same existing subgroups.

1. **CO2 Standards for Medium- and Heavy-Duty Gasoline Engines**
   Staff is proposing to align with U.S. EPA's CO2 standard of 627 g/bhp-hr for 2016 and subsequent MY gasoline engines.[9] The number of gasoline engines federally certified for heavy-duty vehicle use is limited, and has ranged between three and five engine models (U.S. EPA, 2011b). Heavy-duty gasoline engines are developed primarily for heavy-duty PUVs, but are also sold as loose engines for VV manufacturers (ibid).

2. **CO2 Standards for Medium- and Heavy-Duty Diesel Engines (Primary Phase-In Option)**
   The federal CO2 standards for diesel and other similar engines are based on a vehicle group's weight class as defined above in Table 6. To match U.S. EPA's engine requirements, Table 7 outlines the proposed CO2 standards which would begin with 2014 diesel engine MYs, and then become more stringent for 2017 and subsequent MYs.

Table 7 - Proposed CO2 Standards for Class 2b to 8 Diesel Engines

Final HD Diesel Engine Standards (gCO2/bhp-hr)					
	LHD (2b-5)	MHD (Class 6-7)		HHD (Class 8)	
		Vocational Veh	Tractors	Vocational Veh	Tractors
2014-2016 MY	600	600	502	567	475
2017 and Later	576	576	487	555	460

Appendix II outlines alternate phase in schedules allowed for the engine CO2 standards and provides additional detail on the standards.

d. Distinctions between California and Federal Phase 1 Programs
As discussed above, staff intends to align California's GHG requirements for medium- and heavy-duty engines and vehicles with those of the U.S. Phase 1 GHG regulations, to allowing manufacturers to use harmonized compliance strategies to meet both federal and state requirements. Staff expects that almost all engine and vehicle manufacturers would comply with the proposed Phase 1 GHG regulations by demonstrating compliance

[9] Engines derived from gasoline engines, such as natural gas engines derived from gasoline engines, must comply with the gasoline engine standards.

with the U.S. Phase 1 GHG requirements, and then be considered "deemed to comply" with California's requirements.

However, the proposed Phase 1 regulation does incorporate minor distinctions from the U.S. Phase 1 GHG regulation:

i. **GHG Urban Bus Definition**
For the federal Phase 1 GHG program, U.S. EPA added a new definition in section 4086.012-2 to redefine an urban bus as one that "means a passenger-carrying vehicle with a load capacity of fifteen or more passengers and intended primarily for intracity operation, i.e., within the confines of a city or greater metropolitan area. Urban bus operation is characterized by short rides and frequent stops." This new section 86.012-2 allows manufacturers to install engines other than HHD diesel engines in hybrid bus applications (CFR, 2013).

Staff is proposing to include this new definition of urban bus in California's GHG program to allow for streamlined compliance strategies among manufacturers, but is proposing to change the federal term "urban bus" to "GHG urban bus." This difference in terminology is necessary to maintain California's existing definition for urban bus in 13 CCR 2023(a)(13) "Fleet Rule for Transit Agencies," which requires urban buses to be powered by heavy-duty diesel engines, and therefore conflicts with the federally added new definition (CCR, 2013). California's current definition of an urban bus is: "a passenger-carrying vehicle powered by a HHD diesel engine, or of a type normally powered by a HHD diesel engine, with a load capacity of fifteen (15) or more passengers and intended primarily for intra-city operation."

ii. **Fuel Usage for Certification**
Engine manufacturers certifying with the U.S. EPA are required to use an ultra-low sulfur diesel (ULSD) grade test fuel as specified in Table 1 of 40 CFR 1065.703 (CFR, 2013). For California, engine manufacturers must follow the test procedures and certification guidelines in "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles." The California test procedures allow manufacturers to certify engines in California using either ULSD fuel or a cleaner fuel as described in 13 CCR 1065.703(b)(2) Subpart H (CCR, 2013). Staff recognizes that manufacturers creating California-only engine families may use California-specific diesel fuel for the purposes of certification testing.

iii. "Deemed to Comply," Reporting Data

Manufacturers would be "deemed to comply" with the Phase 1 GHG regulation if they demonstrate compliance with the requirements of the U.S. Phase 1 GHG program. Manufacturers must submit end of year final reports to U.S. EPA as described in the Reporting Requirements of Section g. Copies of all data submitted to U.S. EPA in accordance with the reporting requirements of 40 CFR 1036.205, 1036.250, 1037.205, and 1037.250 would also be required to be submitted to ARB for certification purposes.(CFR, 2013). For California engine or vehicle GHG certification, a manufacturer would be required to submit an application for certification for each engine family or vehicle subfamily. An Executive Order would then be issued by ARB's Executive Officer for any engine or vehicle family that has demonstrated compliance with the proposed California Phase 1 GHG regulations or the federal Phase 1 GHG regulation. Staff is proposing that engine and vehicle manufacturers submit California values, rather than national values, for the number of engines and vehicles sold and produced in California. The California-specific data will be used to determine the level of manufacturer compliance, and emissions reductions achieved in CA.

iv. Certification of Medium-Duty Vehicles from 8,500 to 10,000 Pounds GVWR for 2020 and Subsequent MYs

For 2020 and subsequent MY criteria pollutant emission standards, California requires chassis certification for medium-duty vehicles from 8,500 to 10,000 pounds GVWR. This means manufacturers seeking to certify to California's Phase 1 GHG standards in MY 2020 and later would need to use chassis certification.

In the federal Phase 1 GHG program, a manufacturer may certify medium-duty vehicles from 8,500 to 10,000 pounds GVWR either to the emission standards of 40 CFR 1037.104 or 1037.105, depending on whether the vehicle is certified as a complete or incomplete vehicle for criteria emission standards (i.e., whether it is chassis certified or engine certified). If the vehicle is chassis certified for criteria standards, GHG certification requires compliance with the applicable chassis emission standards (40 CFR 1037.104(f)). However, if the vehicle is certified to incomplete vehicle emission standards through an engine dynamometer, the manufacturer must certify the vehicle to the vocational vehicle GHG emission standards of 40 CFR 1037.105 (CFR, 2013).

In California, the option to certify incomplete medium-duty vehicles (8,500 to 10,000 pounds GVWR) to criteria emission standards will sunset beginning MY 2020. This provision was primarily made to

facilitate in-use verification of vehicle emissions by avoiding the need to remove the engine for in-use emission testing of vehicles certified to engine dynamometer emission standards. To harmonize GHG emissions compliance testing requirements with ARB's criteria emission testing requirements, manufacturers would be required to chassis certify their medium-duty vehicles from 8,500 to 10,000 pounds GVWR, beginning in the 2020 MY to demonstrate compliance with applicable GHG standards..

v. Automatic Engine Shutdown System Requirements

U.S. EPA's Phase 1 GHG regulations contain optional carbon dioxide emission credit provisions for engine manufacturers certifying with automatic engine shutdown systems as shown in 40 CFR 1037.660 that are less stringent and that differ from the engine shutdown requirements in the Idling ATCM (13 CCR 1956.8 (a)(6)(A)) (CCR, 2013; CFR, 2013). Specifically, the federal regulation allows an engine manufacturer to remove the automatic engine shutdown system once the vehicle has accrued 1.29 million miles whereas California's Idling ATCM does not allow the removal of the automatic engine shutdown system for the life of the vehicle. In addition, California's Idling ATCM does not include engine shutdown override provisions for low battery state of charge and ambient temperature conditions.

Engine manufacturers planning to certify diesel-fueled engines in California with federal Phase 1 GHG optional automatic engine shutdown systems must comply with California's 13 CCR 1956.8 (CCR, 2013). Such manufacturers have two options. First, they may comply with the California engine shutdown system requirements in 13 CCR 1956.8(a)(6)(A), which are more stringent than the requirements in 40 CFR 1037.660. Alternatively, they may comply with the optional clean idle emission standards found in 13 CCR 1956.8(a)(6)(C) and utilize the less stringent federal engine shutdown system provisions specified in 40 CFR 1037.660.

e. Amend Definition of "Emission Standard"

On August 23, 2012, ARB approved the adoption of amendments to California's On- Board Diagnostic System Requirements for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles and Engines (OBD II) and Heavy Duty Engine On-Board Diagnostic System Requirements (HD OBD) that included new definitions of the terms "emission standard," "evaporative emission standards," and "exhaust emission standards." The amendments to the OBD II and the HD OBD requirements were approved by the Office of Administrative Law, filed with the Secretary of State, and became effective on July 31, 2013. ARB adopted the revised definition of

"emission standard" as set forth in Health and Safety Code section 39027, pursuant to the statutory authority of HSC sections 39010 and 39601(b), which provide that ARB may revise certain definitions of terms set forth in Chapter 2 of the HSC (commencing with section 39010) in order "to conform those definitions to federal laws and rules and regulations."

In 2004, the U.S. Supreme Court clarified that the definition of standard as it applies to emissions from motor vehicles and motor vehicle engines under Title II of the federal CAA, relates to the emission characteristics of vehicles or engines and requires motor vehicles or motor vehicle engines to emit no more than a certain amount of a given pollutant, be equipped with a certain type of pollution-control device, or have some other design feature related to the control of emissions. *Engine Manufacturers Association v. South Coast Air Quality Management District* (2004) 541 U.S. 246, 253, 124 S.Ct. 1756, 1762 (*EMA*).

Staff is proposing to add a definition of "emission standard" to the Phase 1 GHG regulations, title 13 CCR section 1900(b), the Tractor-Trailer GHG regulation, and the airborne toxic control measure (ATCM) to limit idling from diesel-fueled commercial motor vehicles to be consistent with the definition set forth in *EMA* for purposes of clarity, consistency, and conformity. The new definition is needed to ensure that California's authority to adopt and to enforce emission standards and other emission-related requirements for mobile sources is coextensive with those provisions of section 209 of the federal CAA that establish the parameters of California's unique authority to regulate new on-road mobile sources.

Section 209(a) of the CAA preempts states and local governments from enacting any standard related to the control of emissions from new motor vehicles and engines. However, Section 209(b) of the CAA specifically provides a special exception for California that allows it to request a waiver from section 209(a)'s preemption, which must be granted unless the Administrator of the U.S. EPA makes certain findings. The authority of ARB, acting on behalf of California, to adopt standards related to control of emissions (i.e., emission standards) is effectively circumscribed by the waiver authority of CAA. Amending the definition to conform to the Supreme Court's interpretive definition of standard as it applies to emissions from motor vehicles and motor vehicle engines appropriately recognizes the interplay between federal and state law and the breadth of California's authority.

It is also appropriate to revise and update the definition of "emission standard" from that set forth at section 39027 because the latter definition was enacted by the Legislature in 1975, before significant advancements in vehicular and engine emission control technologies, such as on-board computers and OBD systems, had occurred. Also, significant recent developments in law have also occurred since 1975, including the enactment of the California Clean Air Act of 1988 (AB 2595, Sher), which directed ARB to continue to achieve substantial reductions in new vehicle emissions and substantial improvement in durability of vehicle emission systems, and the U.S. Supreme Court's decision in *Massachusetts v. EPA* (2007) 549 U.S. 497, that greenhouse gases are pollutants subject to regulation under the federal Clean Air Act. (549 U.S. at 1460).

The new, federally conforming definition effectively recognizes the present state of engine technology and the need to clarify that emission discharges into the atmosphere are more than quantitative emission limits, but also include pollution control equipment and other design features of the engine that ensure that emission reductions are achieved. For purposes of consistency and clarity, staff is also proposing to add new definitions of the terms "exhaust emission standards" and "evaporative emission standards" to clarify, where needed, previous references to emission standards. These proposed terms are subcategories of emission standards and are used to specifically identify the specified subcategories, as opposed to the broader term of emission standard that encompasses all standards, including Phase 1 GHG regulation requirements relating to the control of emissions and tailpipe and evaporative numerical limits.

Because the proposed Phase 1 GHG regulation consists of requirements applicable to the engines installed in medium and heavy-duty vehicles and of related, but separate requirements applicable to the vehicles that are powered by those engines, staff is proposing to incorporate the new definitions into two separate provisions of the California Code of Regulations (CCR). Staff is proposing to add definitions of "emission standard," "evaporative emission standards," and "exhaust emission standards" to title 13, CCR section 1956.8(i) to clarify that the Phase 1 GHG requirements applicable to engines are emission standards, and is proposing to add the proposed definition of "emission standard" to proposed new section title 17, CCR section 95662 to clarify that the Phase 1 GHG requirements applicable to vehicles are emissions standards.

The proposed rulemaking action also encompasses proposed amendments to establish optional NOx emission standards for heavy-duty engines. Staff's proposal to add the definitions of "emission standard," "evaporative emission standards," and "exhaust emission standards" to title 13, CCR section 1956.8(i) will also serve to clarify that those

amendments are emissions standards to the extent that they require motor vehicles or motor vehicle engines to emit no more than a certain amount of a given pollutant, be equipped with a certain type of pollution-control device, or have some other design feature related to the control of emissions.

ARB's existing on-road motor vehicle and motor vehicle engine standards are set forth in Article 2, Chapter 1, Division 3 of Title 13, CCR, and the standards and related requirements as set forth in those regulations likewise constitute emission standards under the *EMA* court's definition, as they require on-road motor vehicles or motor vehicle engines to emit no more than a certain amount of a given pollutant, be equipped with a certain type of pollution-control device, or have some other design feature related to the control of emissions. Staff is therefore also proposing to add new definitions of the terms "emission standard", "evaporative emissions standard" and "exhaust emissions standard" into title 13, CCR section 1900(b) to clarify that the requirements applicable to on-road motor vehicles and motor vehicle engines set forth in Article 2, Chapter 1, Division 3 of Title 13, CCR, and the associated remedies provided in the HSC for noncompliance, constitute "emission standards," "evaporative emission standards," or "exhaust emission standards."

3. Technical Feasibility

U.S. EPA thoroughly evaluated the technical feasibility of its Phase 1 GHG standards as part of its 2011 rulemaking and concluded that the technologies likely to be used to comply with the standards are currently available in the marketplace. Because ARB is proposing to harmonize with U.S. EPA's Phase 1 GHG standards, U.S. EPA's technical feasibility analysis is applicable to ARB's proposal. U.S. EPA's technical feasibility analysis is presented in the following documents: Final Rulemaking to Establish Greenhouse Gas Emission Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles, Regulatory Impact Analysis, U.S. EPA-420-R-11-901, August 2011 (U.S. EPA, 2011b) and Final Rule, Greenhouse Gas Emission Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles, published in the Federal Register on September 15, 2011 (U.S. EPA, 2011c).

The following section provides a brief summary of the technical feasibility analysis for each of the three vehicle categories covered by staff's proposal and for the engines that power these vehicles.

a. CO2 Standards for Tractor-Trailers and Heavy-Duty Engines

Strategies to reduce CO2 emissions from tractor-trailers and engines include use of aerodynamic improvements, low rolling resistance (LRR) tires, weight reduction technologies, idle reduction, and engine and

drivetrain efficiency improvements. According to U.S. EPA's analysis, the GHG standards for tractor-trailers and engines can be met with a combination of these technologies which are already available and demonstrated to be effective, in part through U.S. EPA's SmartWay program (U.S. EPA, 2011c).

- Aerodynamic technologies: Improvements to a tractor's aerodynamics reduce the drag forces acting on the tractor, which results in reduced CO2 emissions. Improved aerodynamic packages are already available in the marketplace. All major truck manufacturers already offer at least one SmartWay certified truck model.

- LRR tires: The rolling resistance of tires can be reduced with changes in tread and casing materials, tread design, tire manufacturing process, and maintaining good operating conditions (e.g., inflation pressure). LRR tires, which reduce fuel consumption and CO2 emissions, are already available in the marketplace.

- Weight reduction: Reducing the weight of a vehicle through use of different materials can reduce fuel consumption and CO2 directly and indirectly by increasing vehicle payloads, which can allow additional cargo to be carried by fewer trucks, producing lower emissions on a ton-mile basis. Possible weight reduction strategies considered by U.S. EPA include, but are not limited to, use of aluminum wheels instead of steel wheels, use of single wide tires instead of double wide tires, and use of light-weight aluminum or high strength steel for other body and chassis components.

- Extended idle reduction: Technologies such as auxiliary power systems (APSs) and battery-powered a/c, are already available in the marketplace to reduce extended main engine idling from sleeper cabs which reduces fuel consumption and CO2 emissions. ARB already has an idling reduction requirement in place for California. That regulation is discussed further in Section D of this chapter.

- Vehicle speed limiters: Because fuel consumption and CO2 emissions increase with a vehicle's speed, limiting the maximum speed of a vehicle can reduce fuel consumption and GHG emissions. Vehicle speed limiters are already available in the marketplace.

- Powertrain/transmission efficiency improvements: Fuel consumption and CO2 emissions can be reduced through use of hybrid powertrains which are now commercially available, transmission improvements, and use of low friction lubricants for the drivetrain.

- Engine efficiency improvements: Fuel consumption and CO2 emissions can be reduced by improving engine performance through the use of the following technologies evaluated in U.S. EPA's feasibility assessment: improved combustion process, improved efficiency turbochargers, higher efficiency air handling processes, low temperature exhaust gas recirculation (EGR), engine friction reduction, reduced parasitic loads, optimization of selective catalytic reduction (SCR), mechanical turbocompounding, electric turbocompounding, and bottom cycling. These technologies have all been demonstrated to improve engine performance. It should be noted that not all of these approaches are compatible with one another.

b. CO2 Standards for Heavy-Duty Pickups and Vans

The heavy-duty PUV category includes both diesel and gasoline powered vehicles, with separate standards set for diesel vehicles and gasoline vehicles. Standards are in the form of fleet average standards for each manufacturer, similar to the approach used for light-duty vehicle standards. In setting the standards, U.S. EPA considered over 35 different technologies that could be used to reduce CO2 emissions. The majority of these are already commercially available, and others are beyond the research stage and expected to be in production over the next few years within the timeframes needed to meet the standards. U.S. EPA did not consider technologies still in the research stage because of concerns over the time needed for those technologies to reach the production stage. U.S. EPA's analysis built upon the technical analysis that was used to support its earlier light-duty vehicle GHG rulemaking and considered the potential application of these technologies to heavy-duty PUVs considering the longer timeframes for the heavy-duty standards. Strategies to reduce CO2 emissions from heavy-duty pickups and vans fall into five broad categories summarized below: engine technologies, transmission technologies, vehicle technologies, electrification/accessory technologies and hybrid technologies. Some of these are applicable to diesel engines only, some to gasoline engines only, and some to both. U.S. EPA concluded that the technologies it considered feasible and appropriate could be consistently applied across the heavy-duty PUV category by the 2019 MY when the fleet average standards are fully phased in.

- Engine technologies: Fuel consumption and CO2 emissions can be reduced with the use of low-friction lubricants, reduction of engine friction losses, and cylinder deactivation during light-load operation, variable valve timing, stoichiometric gasoline direct-injection technologies, and diesel engine and after-treatment improvements. Some of these technologies are already available in the heavy-duty engine market.

- Transmission technologies: Fuel consumption and CO2 emissions can be reduced with improved automatic transmission controls and use of six, seven, and eight speed transmissions.

- Vehicle technologies: Fuel consumption and CO2 emissions can be reduced through the use of LRR tires, aerodynamic drag reducing technologies, and vehicle weight reduction.

- Electrification, accessory, and hybrid technologies: Technologies evaluated include electric and electro-hydraulic power steering, high efficiency alternators, electrically driven on-demand water pumps and cooling fans, and improving a/c system efficiency thereby reducing engine load to power the a/c system.

c. CO2 Standards for VVs

VVs falling into weight classes 2b through 8 (i.e., those above 8,500 pounds GVWR) are powered by both gasoline and diesel powered engines. In developing the standards for VVs, U.S. EPA acknowledged that these vehicles cover a wide variety of applications which influences both vehicle design and usage patterns. Accordingly, U.S. EPA set standards that would not adversely impact how these vehicles operate. The strategies to reduce CO2 emissions from VVs are similar to those for tractor-trailers, including aerodynamic improvements, use of LRR tires, idle reduction, vehicle weight reduction, use of hybrid powertrains, and engine efficiency improvements, each of which is described above.

Because VVs have different duty cycles than tractor-trailers, the mix of technologies used to meet the standards may be different than for the tractor-trailers. For example, VVs typically drive fewer miles at lower speeds with more stops and starts than tractor-trailers. Because of these differing duty cycles, aerodynamic improvements would not have as much impact on VVs. The VV standards set by U.S. EPA are based on readily available improvements in tire and engine technologies.

d. HFC Standards for Tractor-Trailers and Heavy-Duty PUVs

A vehicle's a/c system can contribute to GHG emissions through leakage of HFC. The federal Phase 1 program sets HFC emission standards for tractor-trailers and heavy-duty PUVs to limit a/c leakage emissions. Strategies to reduce HFC emissions include use of leak-tight components or use of alternative, low-global warming potential refrigerants. Availability of low leakage a/c components is being driven by the light-duty GHG regulation, so these technologies are already commercially available.

e. N2O and CH4 Standards for Heavy-Duty PUVs and Heavy-Duty Engines

In addition to CO2 standards, the federal Phase 1 program also sets N2O and CH4 standards for heavy-duty PUVs and all heavy-duty engines. These standards are set at levels to cap N2O and CH4 emissions at current levels based on emission control technologies already in use and available. The intent of these standards is to prevent future emission increases of these pollutants.

4. Environmental Impacts Analysis

This section provides an environmental analysis for the proposed Phase 1 GHG regulations described above. Based on staff's review, staff has determined that implementing the proposed Phase 1 GHG regulations would not result in any potentially significant adverse impacts on the environment. This analysis provides the basis for reaching this conclusion. This section of the staff report also discusses environmental benefits expected from implementing the proposed regulation.

a. Methods of Compliance

The proposed regulation would harmonize with the existing federal regulation and, other than minor labeling and reporting requirements would place no new or additional demands upon the regulated community. Regardless of ARB's proposed regulation, the regulated community is already certifying lower-emitting engines and vehicles in order to meet the existing federal regulation. While this regulation will merely mirror the same requirements found in the federal Phase 1 program, it does have several administrative distinctions from the federal regulation, which are described in section IV.A.2.d. of this staff report.

b. Beneficial Impacts

No additional direct emission benefits are expected with staff's proposed Phase 1 GHG regulations because the proposed regulations are being adopted to harmonize with existing federal requirements and no additional actions to reduce emissions are expected beyond what is already being carried out to comply with the federal Phase 1 GHG program. Staff quantified the emission benefits of the federal Phase 1 program in California, as shown below in Table 8. Appendix III provides a more detailed discussion of the assumptions and methodology used in estimating the emission impact of the federal Phase 1 program.

Table 8 – California Phase 1 CO2 Benefits[10]

CO2 Emissions from Affected Vehicles (in million metric tons per year)			
Calendar Year	Baseline CO2 Emissions	CO2 Emissions with Phase 1	CO2 Reductions
2020	43.2	40.1	7.18%
2035	55.5	48.6	12.5%

c. **Resource Areas with No Impacts**

Staff concludes that the proposed Phase 1 regulations would not result in any significant or potentially significant adverse impacts on the environment because compliance with the regulation does not involve or result in any new activities that could affect the environment other than what is already being carried out by the regulated community to comply with the federal Phase 1 program. The proposed Phase 1 regulations are being adopted to harmonize with existing federal requirements and no additional actions are expected.

No discussion of alternatives or mitigation measures is necessary because no significant adverse environmental impacts were identified.

5. Economic Impact Assessment/Cost Analysis

The following economic impact assessment/cost analysis has been prepared for the proposed Phase 1 regulations rulemaking action in accordance with the provisions of Government Code section 11346.3b(1)(A)-(D).

California's proposed Phase 1 GHG regulations harmonize with the federal Phase 1 GHG regulations. Complying with the federal GHG requirements will have associated costs, which are outlined in the federal rulemaking package. Compliance is or will already be required of engines and vehicles in California due to the federal program. Therefore, no additional costs would be incurred should California adopt these requirements, other than the requirement for manufacturers to provide a copy of submitted materials and some California-specific reporting data to California. This is expected to cost no more than $1000 per manufacturer for report reproduction and postage. The adoption by California of the federal program would not result in tangible benefits at this time, so a cost-benefit calculation cannot be made. The purpose of adopting this program is to enable California enforcement of the Phase 1 GHG standards, to keep California's requirements at least as stringent as

[10] Baseline CO2 emissions shown in Table 8 are without the Tractor-Trailer GHG regulation. The Tractor-Trailer GHG regulation (without the amendments proposed in this staff report) was estimated to achieve 0.7 million metric tons carbon dioxide equivalent (MMTCO2e) in 2020 and 0.9 MMTC02e in 2035, which is equivalent to about a 1.6 percent reduction.

federal requirements, to ensure continued compliance in the event that the federal program were to be terminated, and to pave the way for additional requirements in the future.

a. Creation or Elimination of Jobs and New and Existing Businesses within the State

Minimal impacts to the creation or elimination of jobs and businesses within California are anticipated. This is because nearly all affected engine and vehicle manufacturers are located outside of California, and because the costs to such manufacturers are so small as to be absorbed without changing the number of staff or driving any businesses out of business.

b. Competitive Advantages or Disadvantages for Businesses Currently Doing Business within the State

No significant impacts to the competitive advantages or disadvantages for businesses currently doing business within the state are anticipated because the costs to affected vehicle and engine manufacturers are so small.

6. Regulatory Alternatives

In developing the proposed Phase 1 GHG regulations, staff also considered alternative proposals. 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 the affected private persons than the proposed regulation. Brief descriptions of the alternative proposals, including the reasons they were rejected, are listed below.

a. No Action

One alternative staff considered was to take no action, i.e., not to adopt the Phase 1 GHG regulations. Taking no action would not appear to significantly impact emission reductions since engine and vehicle manufacturers are already certifying lower-emitting engines and vehicles in order to meet the existing federal Phase 1 program. Staff rejected this option because existing law requires all new vehicles and engines to be certified by ARB before they can be sold or offered for sale in California, and because staff's proposal would allow ARB to verify and enforce these regulatory standards, thereby potentially leading to higher levels of compliance. In addition, by adopting the proposed regulation, California would harmonize with the federal requirements and assure engine manufacturers that California will not create separate/different Phase 1 standards compared to the federal standards.

b. More Stringent Emissions Requirements

Another alternative considered by staff was to set stricter emissions requirements than the federal Phase 1 program. By requiring more

stringent standards for GHG emissions, specifically CO2, CH4, N2O, and HFC, California could obtain greater emissions benefits. Staff rejected this alternative because the implementation dates for Phase 1 are so imminent (beginning in 2014 and ratcheting down in 2017); there would not be adequate lead time for engine and vehicle manufacturers to design and deploy new engines and vehicles. Imposing California-only standards now would also disrupt engine and vehicle manufacturers' federal compliance strategies that are already underway. Instead of proposing stricter Phase 1 GHG standards, staff is opting to work with U.S. EPA on the next, more stringent, phase of GHG standards, Phase 2. This rulemaking development effort is expected to be completed within two to three years.

c. Do Not Adopt a "Deemed to Comply" Provision

A third alternative proposal considered was to require manufacturers to certify their vehicles and engines for California, without adopting a "deemed to comply" provision. Requiring manufacturers to certify their vehicles and engines specifically for California could provide ARB more ability to verify compliance separately from U.S. EPA. However, staff rejected this alternative because staff determined that the additional level of assurance was outweighed by additional time needed by ARB staff to evaluate and process applications, and the additional time that manufacturers would be required to wait before obtaining executive orders if the deemed to comply provision was not available.

d. Create Separate Emissions Averages for California

As described above in Section 2, the federal Phase 1 GHG program includes fleet average standards for manufacturers of heavy-duty PUVs, as well as averaging, banking and trading provisions for engine and vehicle manufacturers. One alternative staff considered was to require manufacturers to meet the averaging requirements specifically for the vehicles produced for California, separate from the nationwide average. For example, a VV manufacturer could be required to show that it met 388 g/ton-mile CO2 for MY 2014 just for vehicles sold for use in California. Although requiring a separate average for California could result in lower emissions in California, this alternative was rejected primarily because it could, as previously discussed, disrupt engine and vehicle manufacturers' federal compliance strategies, with little or no overall emissions benefit.

e. No Early Credits

The last alternative considered by staff was to harmonize with the federal Phase 1 GHG program from this point forward in time, but not to recognize the early credits already granted by the federal Phase 1 GHG program. Staff rejected this alternative because it believes that recognizing any early credits granted by the U.S. EPA would ensure that manufacturers have the same compliance flexibility in California as the federal program

and that manufacturers can comply as planned with the aligned regulations, rather than having to create a separate compliance plan for California.

B. Tractor-Trailer GHG (Amendments)

The proposed amendments would harmonize the tractor requirements of the Tractor-Trailer GHG regulation (ARB, 2010) with the existing federal Phase 1 program (U.S. EPA, 2011c) and the proposed California Phase 1 regulations, without loss of GHG emission benefits from the vehicles being regulated. Staff is also proposing to modify the Tractor-Trailer GHG regulation to clarify the requirements for tractors retrofitted with sleeper-cab compartments, add a definition of "emission standard," and make other minor clarifying and corrective changes. The text of the proposed amended Tractor-Trailer GHG regulation is contained in Appendix I.B.

1. Background

a. Tractor-Trailer GHG Requirements for 2011 and Subsequent Tractors

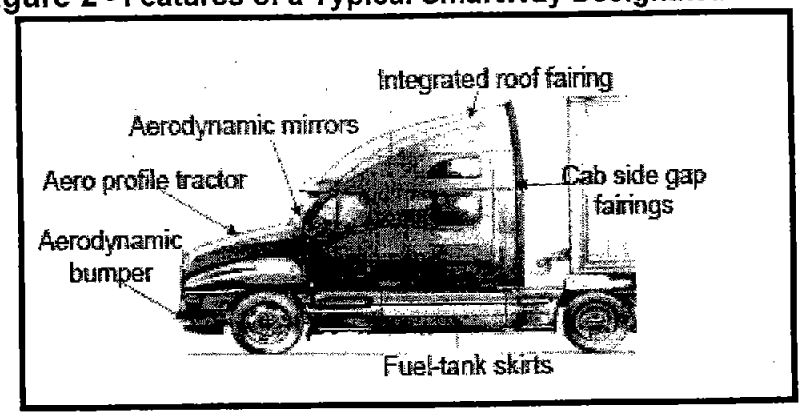
In December 2008, the Board approved the Tractor-Trailer GHG regulation, which became effective January 1, 2010 (ARB, 2010). The regulation reduces the GHG emissions from long-haul tractors and trailers by improving the aerodynamic performance and reducing the rolling resistance of tractor-trailers. The requirements specified in the regulation are based on elements of the U.S. EPA SmartWay program. Currently, the Tractor-Trailer GHG regulation requires 2011 and subsequent MY sleeper-cab tractors pulling 53-foot or longer box-type trailers on California highways to be SmartWay designated tractor models. SmartWay designated tractors are sleeper-cab tractors that have been outfitted at the point of sale with equipment that significantly reduces GHG emissions and improves fuel efficiency. This equipment includes aerodynamic improvements such as a streamlined hood, integrated high-roof fairings, fuel tank fairings, cab side gap fairings, aerodynamic mirrors, and aerodynamic bumpers. It also includes the use of SmartWay verified LRR tires. Figure 2 illustrates the aerodynamic features of a typical SmartWay designated tractor.

Launched in 2004, SmartWay is a voluntary U.S. EPA program that reduces transportation-related emissions by creating incentives to improve supply chain fuel efficiency. Under the SmartWay program, U.S. EPA establishes performance criteria and reviews test data to ensure that designated tractors and trailer models have been demonstrated to be more fuel efficient than their traditional counterparts.

SmartWay designated tractors must also demonstrate, using the Interim Test Method for Verifying Fuel-Saving Components for SmartWay: Modifications to SAE J1321 (U.S. EPA SmartWay, 2012), that they meet

or exceed the fuel efficiency performance of at least one current SmartWay designated sleeper-cab tractor model.

Figure 2 - Features of a Typical SmartWay Designated Tractor



The Tractor-Trailer GHG regulation also requires 2011 and subsequent day-cab[11] tractors pulling 53-foot or longer box-type trailers on California highways to be equipped with SmartWay verified LRR tires. The regulation does not establish aerodynamic equipment related requirements for day-cab tractors because the SmartWay program does not designate day-cab models.

b. Phase 1 Program Certification Requirements for 2014 and Subsequent Tractors

As discussed above, the federal Phase 1 GHG program establishes national GHG emission certification standards for heavy-duty engines and vehicles, beginning with the 2014 MY and increasing in stringency through the 2019 MY. For tractors, these standards are summarized in Table 4 above in Section A (U.S. EPA, 2011b).

In establishing the federal Phase 1 GHG program, U.S. EPA developed an emissions model, called the "GHG Emissions Model" or "GEM," that provides vehicle manufacturers with options on how to achieve the required emission reductions (U.S. EPA, 2011c). GEM includes several input parameters, including aerodynamic performance and tire rolling resistance. The stringency of the required emission reductions is based on vehicle type. For example, tractors equipped with a sleeper cab are required to meet more stringent requirements than are day-cab tractors. Certifying vehicles using the GEM model gives manufacturers the flexibility of making significant GHG emission reductions with some of their vehicles in order to produce other vehicles that meet higher emission

[11] The requirement for SmartWay verified LRR tires is applicable to a "2011 or subsequent MY heavy-duty tractor, including but not limited to sleeper-cab heavy-duty tractors," but this is effectively a requirement for day-cab tractors since sleeper-cab tractors are required to be SmartWay designated models (which include low-rolling resistance tires).

levels. This flexibility enables the manufacturer to meet customer demands by allowing them to produce vehicles that meet specific job function needs.

As shown in Figure 3 below in the Environmental Impacts Analysis section, the California emission benefits of the federal Phase 1 GHG program are projected to be greater than those of the Tractor-Trailer GHG regulation. Most of the additional benefits would be achieved based on three key factors. First, the federal Phase 1 GHG emission reduction requirements for sleeper-cab tractors are more stringent, in aggregate, than the sleeper-cab tractor requirements in the Tractor-Trailer GHG regulation. Second, the federal Phase 1 GHG program includes aerodynamic performance requirements for day-cab tractors that are not required in the Tractor-Trailer GHG regulation. Third, the federal Phase 1 GHG program covers all heavy-duty vehicle vocations and weight classes, not just Class 7 and 8 tractors hauling 53-foot box trailers covered by the Tractor-Trailer GHG regulation.

The federal Phase 1 GHG program introduces additional regulatory requirements on tractor owners subject to the Tractor-Trailer GHG regulation. The federal Phase 1 GHG program (which is mirrored in the proposed Phase 1 regulations) and the Tractor-Trailer GHG regulation overlap in that they both require tractors to meet vehicle aerodynamic and tire rolling resistance requirements. Therefore, amendments to the Tractor-Trailer GHG regulation are needed to remove duplicative requirements.

2. Summary of Proposed Amendments

a. Harmonization with the Phase 1 GHG Regulations

Staff is proposing to amend the Tractor-Trailer GHG regulation by sunsetting the requirements of the regulation for 2014 and subsequent MY tractors.

i. Sunsetting Sleeper-Cab Tractor Requirements

For sleeper-cab tractors, the proposed amendment would eliminate the requirement for 2014 and subsequent model tractors to be SmartWay designated models. However, in conjunction with the proposed adoption of the Phase 1 GHG regulations, these tractors will be required to meet the requirements that are aligned with the requirements for such tractors set forth in the U.S. Phase 1 GHG regulations that are more comprehensive and stringent than the Tractor-Trailer GHG requirements for these tractors. Thus, the proposal to sunset the 2014 and subsequent model sleeper-cab tractor requirements in the Tractor-Trailer GHG regulation would not reduce the emission benefits of the existing regulation but would instead

remove unnecessary duplication of regulatory requirements on fleets operating in California.

The proposed amendment would also result in 2014 and subsequent model sleeper-cab tractors no longer being subject to the provisions of the Tractor-Trailer GHG regulation requiring tractor aerodynamic technologies to be maintained in good operating condition. However, the Phase 1 GHG regulations have provisions that address this issue by prohibiting the modification of a tractor from its certified configuration during its useful life, and restricting modifications during its post-useful life. At the end of a tractor's useful life (435,000 miles or 10 years, whichever comes first), certified tractors can only be modified if the modification results in reduced GHG emissions (U.S. EPA, 2011c). The U.S. Phase 1 GHG regulations also require manufacturers to provide tractor purchasers with written instructions for properly maintaining the tractor (U.S. EPA, 2011c). In addition, ARB deploys enforcement staff in the field throughout California to ensure that all vehicles comply with adopted regulations; ARB's adoption of the Phase 1 standards will allow ARB's enforcement staff to enforce the Phase 1 program. Staff believes these provisions will ensure 2014 and subsequent model Phase 1 certified tractor aerodynamic technologies will be maintained in good operating condition.

The U.S. Phase 1 GHG regulations also allow tractor manufacturers to certify 2013 MY tractors to the 2014 MY U.S. Phase 1 GHG standards for the purpose of obtaining emission credits (U.S. EPA, 2011c). Staff is proposing to exempt 2013 MY tractors certified to the U.S. 2014 MY Phase 1 standards from the tractor requirements of the Tractor-Trailer GHG regulation to harmonize the requirements between the U.S. Phase 1 GHG regulations and the Tractor-Trailer GHG regulation.

Regarding the applicability of local-haul and short-haul exemption status, staff is proposing to continue to allow 2014 and subsequent model heavy-duty tractors to be eligible for the short-haul tractor and local-haul tractor exemptions. The trailers they pull would continue to be exempt as well.

ii. **Sunsetting Day-Cab Tractor Requirements**

The proposed amendments would eliminate the requirement for 2014 and subsequent model day-cab tractors to use SmartWay verified LRR tires. As with sleeper-cab tractors, these tractors will be certified to the Phase 1 GHG emission standards. As discussed above, the affected day-cab tractors under the Tractor-Trailer GHG regulation will be meeting more stringent requirements under the Phase 1 GHG program. In addition to meeting requirements for tire rolling resistance, day-cab tractors certified to Phase 1 GHG requirements will also have

to meet aerodynamic performance requirements that are not found in the Tractor-Trailer GHG regulation. Thus, the proposal to sunset the 2014 and subsequent model day-cab tractor requirements in the Tractor-Trailer GHG regulation would not reduce the emission benefits of the existing regulation and would remove unnecessary duplication of regulatory requirements on fleets operating in California.

b. Amend Definition of Sleeper-Cab Tractor

Staff is proposing to replace the definition of "'sleeper-cab" with a definition of "sleeper-cab tractor" that, for purposes of this regulation, defines a sleeper-cab tractor as a tractor originally manufactured with a tractor body that has a compartment, typically containing a bed, located behind the driving compartment.

The Tractor-Trailer GHG regulation currently requires 2011 and subsequent model heavy-duty sleeper-cab tractors pulling 53-foot or longer box-type trailers in California to be SmartWay designated models. This requirement was adopted in 2008 and became effective January 1, 2010. Staff's intention in establishing this requirement was to ensure that new tractor purchasers subject to the regulation select SmartWay designated tractors when purchasing new sleeper-cab tractors. For all other 2011 and subsequent model tractor configurations, such as day cabs, the regulation only requires the use of SmartWay verified LRR tires. Staff recognizes that owners may retrofit pre-owned 2011 and subsequent model tractors to meet their specific job-related needs. This may include the installation of a sleeper-cab compartment in a day cab tractor. In these instances, staff believes it is not appropriate to require the tractor to be a SmartWay designated tractor. Instead, the tractor originally purchased as a day cab should only be required to meet requirements of the regulation applicable to day cabs. To this end, staff is proposing amendments to modify the definition of a sleeper-cab tractor.

With the proposed harmonization amendments implemented, owners that have 2011 and subsequent model day-cab tractors that retrofit them with after-market sleeper-cab compartments would only be required to meet requirements of the regulation applicable to day cabs.

c. Add Definition of "Emission Standard"

In 2004, the U.S. Supreme Court clarified that the definition of standard as it applies to emissions from motor vehicles and motor vehicle engines under Title II of the federal CAA, relates to the emission characteristics of vehicles or engines and requires motor vehicles or motor vehicle engines to emit no more than a certain amount of a given pollutant, be equipped with a certain type of pollution-control device, or have some other design feature related to the control of emissions (EMA, 2004).

Staff is proposing that the Tractor-Trailer GHG regulation add a definition of "emission standard" to be consistent with the definition set forth in *EMA* for purposes of clarity, consistency, and conformity. Under the federal definition, requirements to equip tractors and trailers with specified aerodynamic equipment and LRR tires relate to a requirement that a vehicle be equipped with a certain type of pollution-control device or a design feature related to the control of emissions, and are emission standards. The proposed amendments are intended to make clear that the definition of emission standard as used in the Tractor-Trailer GHG regulation conforms to the federal definition. The proposed definition, which modifies the definition of "emission standard" as set forth in HSC section 39027, is authorized by HSC sections 39010 and 39601 in that the proposed definition conforms with existing federal definitions (HSC, 2013). For purposes of consistency and clarity, staff is also proposing to add new definitions of the terms "exhaust emission standards" and "evaporative emission standards" to clarify, where needed, previous references to emission standards. These proposed terms are subcategories of emission standards and are used to specifically identify the specified subcategories, as opposed to the broader term of emission standard that encompasses all standards, including Tractor-Trailer GHG regulation requirements relating to the control of emissions.

3. Environmental Impacts Analysis

This section provides an environmental analysis for the proposed amendments to the Tractor-Trailer GHG regulation. Based on staff's review, staff has determined that implementing the proposed amendments to the Tractor-Trailer GHG regulation described above would not result in any potentially significant adverse impacts on the environment. This analysis provides the basis for reaching this conclusion. This section of the staff report also discusses environmental benefits expected from implementing the proposed amendments.

a. Prior Environmental Analysis

On December 11, 2008, the Board approved the Tractor-Trailer GHG regulation set forth in 17 CCR 95300-95312, and later amended it on December 17, 2010 (CCR, 2013). This regulation reduces GHG emissions from long-haul tractor-trailers by requiring them to utilize U.S. EPA SmartWay verified or designated technologies that will improve fuel efficiency. The environmental analyses for the regulation and its amendments found the regulation would result in no significant adverse impacts to the environment and would result in beneficial impacts to air quality. As discussed in Appendix C of the original staff report for the regulation (ARB, 2008a), staff estimated that the statewide GHG emission benefits of the regulation would be 1.0 MMTCO2e in 2020. From 2010 to

2020, the cumulative GHG emission benefits were estimated to be 7.8 MMTCO2e statewide.

On December 17, 2010, the Board approved amendments to the regulation that provided additional flexibility to affected fleets, providing them more time to comply with the tire requirements of the regulation and allowing more large fleets the opportunity to retrofit their trailers with appropriate aerodynamic technologies. At the time, staff lowered the emission benefit estimates associated with the regulation to reflect the economic downturn experienced nationwide and in California. The 2020 GHG emission benefits from the regulation were adjusted from 1.0 to 0.7 MMTCO2e, and the 2010 to 2020 cumulative benefits were adjusted down from 7.8 to 5.1 $MMTCO_2e$ to reflect the economic downturn. Also, because the amendments provided delays in tractor-trailer compliance deadlines, the 2010 to 2020 cumulative statewide GHG emission benefits were estimated to drop by approximately 6 percent, from 5.1 $MMTCO_2e$ to 4.8 MMTCO2e. This loss of emission benefit was minimal compared to the emission benefits of the program overall and the necessary flexibility it provided fleets to help facilitate compliance.

b. Methods of Compliance

Staff's proposal would, in conjunction with the proposed Phase 1 GHG regulation, align the California requirements with the requirements of the U.S. Phase 1 GHG regulations and places no new or additional demands upon the regulated community.

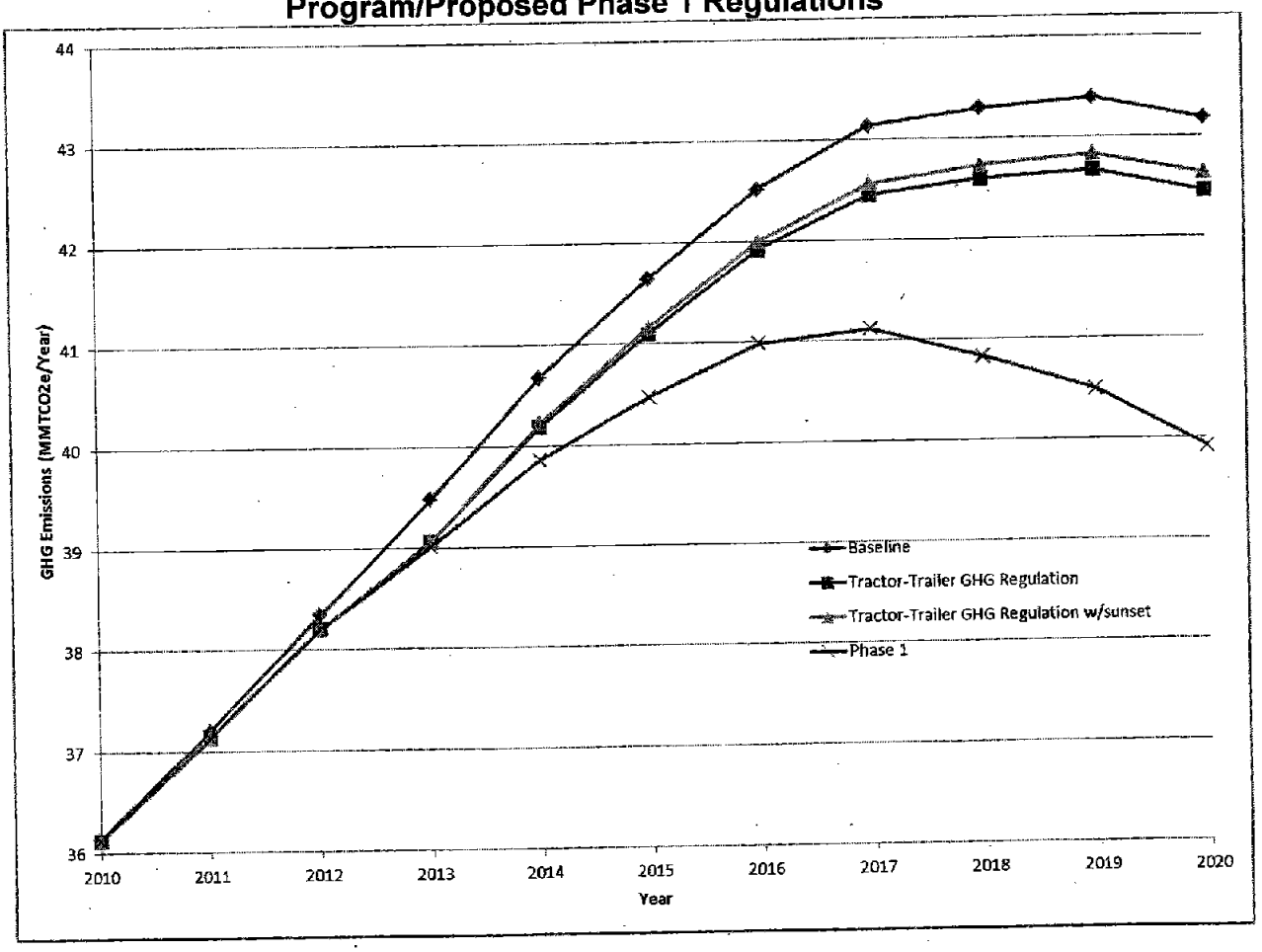
c. Beneficial Impacts

The proposed amendments would not require any additional compliance requirements beyond what is already being required in California. No direct emissions benefits are associated with staff's proposal because these changes largely correspond with the existing federal Phase 1 GHG program and would not generate additional emission reductions, but rather enable ARB regulations to be consistent with federal regulations. However, as discussed previously in Chapter IV.B.2.a, the federal Phase 1 GHG program is more stringent and projected to result in greater emission benefits than those of the existing Tractor-Trailer GHG regulation.

The amendments to sunset the requirements for 2014 and subsequent MY tractors, intended to remove unnecessary duplication of regulatory requirements on fleets operating in California, taken alone could result in emission reductions decreasing from 0.7 to 0.5 MMTCO2e statewide in the year 2020. However, as discussed above in section B.2.a., Summary of Proposed Amendments, this reduction in emission benefits will be offset by the requirement for 2014 and subsequent model tractors to meet the more stringent federal Phase 1 GHG standards. Staff estimates

implementation of the federal Phase 1 GHG program would result in an emission reduction benefit of 3.1 MMTCO2e statewide in the year 2020. Figure 3 shows the statewide baseline and controlled GHG emissions for calendar years 2010 through 2020. As seen in Figure 3, the emission benefit of the existing Tractor-Trailer GHG regulation is slightly decreased by the sunsetting of the 2014 and subsequent MY tractor requirements. However, this is more than offset with the implementation of the federal Phase 1 program during the same timeframe, which will result in significant emission reductions that would not be realized from the Tractor-Trailer GHG regulation. Taken together, there will be an overall emissions benefit in 2020 of about 2.5 MMTCO2e. A more detailed discussion of the assumptions and methodology used in estimating the emission benefits of the proposed amendments and the federal Phase 1 program is provided in Appendix III.

Figure 3 - Statewide GHG Emissions without Regulation (Baseline), with the Tractor-Trailer GHG Regulation, with the Amended Tractor-Trailer GHG Regulation, and with the Federal Phase 1 Program/Proposed Phase 1 Regulations



d. Resource Areas with No Impacts

Staff concludes that the amendments would not result in any significant or potentially significant adverse impacts on the environment because the proposed amendments primarily modify language and regulatory requirements to be consistent with the language already found in federal regulation. They do not involve or result in any new requirements other than what is currently required by the federal Phase 1 program or the existing Tractor-Trailer GHG regulation.

Therefore, the proposed amendments would not require any action by regulated parties that could adversely affect, either directly or indirectly, any of the resource areas: aesthetics; agriculture and forest resources; air quality; biological resources; cultural resources; geology and soils; GHG emissions; hazards & hazardous materials; hydrology and water quality; land use planning; mineral resources; noise; population and housing; public services; recreation; transportation/traffic; or utilities/service systems.

No discussion of alternatives or mitigation measures is necessary because no significant adverse environmental impacts were identified.

4. Economic Impact Assessment/Cost Analysis

The following economic impact assessment/cost analysis has been prepared for this rulemaking action in accordance with the provisions of Government Code section 11346.3b(1)(A)-(D).

The proposed amendments to the Tractor-Trailer GHG regulation would remove the equipment requirements on 2014 and subsequent MY tractors and clarify the definition of "sleeper-cab tractor." No additional costs would be incurred by the affected regulated entities: driver, tractor owner, motor carrier, California-based broker, California-based shipper, and California-licensed vehicle dealer.

a. Creation or Elimination of Jobs and New and Existing Businesses within the State

No significant impacts to the creation or elimination of jobs and businesses within California are anticipated. This is because the proposed amendments do not involve or result in any new requirements other than what are currently being required by the federal Phase 1 program or the existing Tractor-Trailer GHG regulation.

b. Competitive Advantages or Disadvantages for Businesses Currently Doing Business within the State

No significant impacts to the competitive advantages or disadvantages for businesses currently doing business within the state are anticipated because the amendments would not result in any additional costs to affected regulated entities.

c. Potential Costs to Local and State Agencies

The proposed amendments are not anticipated to have any cost impacts to local or state agencies since they would not result in any additional costs to affected regulated entities.

5. Technical Feasibility

The proposed amendments to the Tractor-Trailer GHG regulation all consist of clarifying or deleting existing requirements. Because the existing Tractor-Trailer GHG regulation is technically feasible, the proposed amendments are therefore also technically feasible.

6. Regulatory Alternatives

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 the affected private persons than the proposed Tractor-Trailer GHG regulation amendments.

The primary alternative considered by staff was not to amend the Tractor-Trailer GHG regulation, but this alternative was rejected in part because it would result in duplicative California-only requirements for owners of Phase 1 GHG certified tractors that would also be subject to the regulation. Also, making no changes to the regulation would require 2011 and subsequent MY day-cab tractors that are later retrofitted with sleeper-cab compartments to be SmartWay designated models. Day-cab tractors cannot readily be retrofitted to meet the SmartWay designation requirements since many of the required components are major design elements incorporated at the time of manufacture. It was never staff's intention to require day-cab tractors retrofitted with sleeper-cab compartments to meet SmartWay designation requirements.

C. Optional Low NOx Emission Standards (New Proposal)

The proposed new regulation would establish the next generation of optional NOx standards for heavy-duty engines, and consists of three optional NOx emission standards of 0.1 g/bhp-hr, 0.05 g/bhp-hr, and 0.02 g/bhp-hr (i.e., 50 percent, 75 percent, and 90 percent lower than the current mandatory NOx emission standard of 0.2 g/bhp-hr). The text of the proposed Optional Low NOx engine emission standards is contained in Appendix I.C.

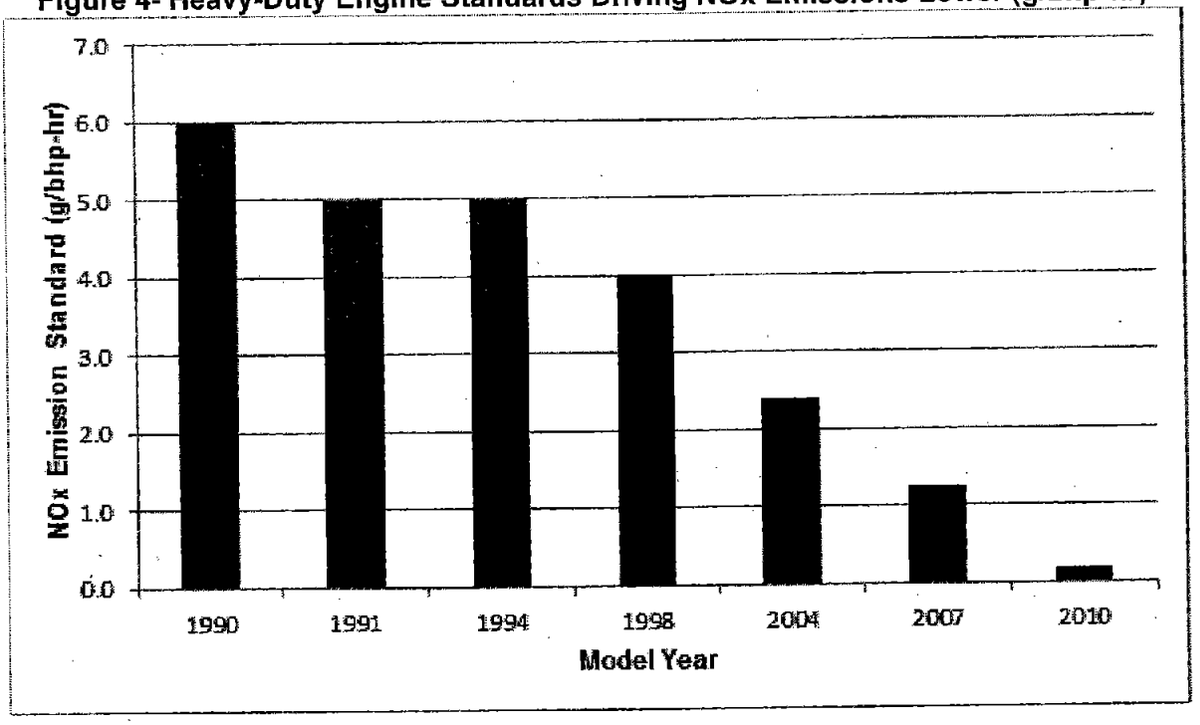
1. Background

California is the only state with the authority to adopt and enforce emission standards and test procedures for new motor vehicles and new motor vehicle engines that differ from federal emission standards and test procedures (FCA, 2004). This proposal would establish optional exhaust emission standards for NOx that are more stringent than current federal and California standards to further reduce emissions from a significant emissions source.

California has a long history of progress to reduce harmful air contaminants in order to protect the health of its citizens. Since the 1960's ARB has controlled mobile and stationary sources by establishing increasingly more stringent fuel and motor vehicle emission standards. Although reducing California's heavy-duty engine emission standards has been effective in reducing fleet emissions for trucks whose operations are limited to California, a sizable portion of the California vehicle miles traveled are from interstate trucks, and ARB has therefore needed to develop lower emission standards in conjunction with U.S. EPA. Since 1990, ARB has typically aligned California's heavy-duty engine emission standards with U.S. EPA standards (California Achievements, 2006).

Since 1990, heavy-duty diesel engine manufacturers have adopted several technologies and strategies to meet increasingly stringent NOx emission standards, as illustrated in Figure 4. In the early 1990's most manufacturers implemented injection timing retard, increased fuel injection pressure, and reduced the intake manifold temperature. To meet the 1998 emission standards, engine manufactures built on the previous technologies and added improved combustion chamber design, electronic controls, EGR and charge air cooling. To meet the even lower 2004 standards, manufacturers used the previous technologies and added cooled EGR, variable geometry turbocharger (VGT), and common rail fuel injection. For meeting the 2007 emission standards, previous technologies were used plus ULSD fuel, and higher EGR rates (in addition to a diesel oxidation catalyst (DOC), and a diesel particulate filter (DPF) to reduce PM). To meet the current 2010 standards, SCR was added to further control NOx. Not all engine manufacturers used all these techniques at the specific times noted, but in general these are the emission controls that were employed to dramatically lower heavy-duty engine NOx (and PM) emissions over the past 20 years.

Figure 4- Heavy-Duty Engine Standards Driving NOx Emissions Lower (g/bhp-hr)



In addition to the mandatory NOx standards shown in Figure 4, ARB in the past has also established optional, lower standards. From 1998 to 2003, optional NOx standards were in place for diesel-cycle engines. The optional standards ranged from 2.5 g/bhp-hr to 0.5 g/bhp-hr, at 0.5 g/bhp-hr increments. This range of standards was substantially lower than the mandatory 4.0 g/bhp-hr NOx engine emission standard. Starting in 2004, engine manufacturers could choose to certify at an optional NOx+ NMHC standard ranging from 1.8 g/bhp-hr to 0.3 g/bhp-hr, at 0.3 g/bhp-hr increments for heavy-duty vehicles. This was significantly lower emissions than the standard at the time of 2.4 g/bhp-hr NOx+NMHC (or 2.5 g/bhp-hr with 0.5 NMHC cap) standard. The optional standards allowed local air districts and ARB to preferentially provide incentive funding to buyers of trucks with engines certified to the optional standards and enabled buyers of such trucks to generate marketable emission reduction credits for use in local air district mobile source emission credit programs. They also helped to advance the development of emission reduction technology to prepare for the next round of mandatory ARB and U.S. EPA emission standards. A number of natural gas engines were certified to the 2004 optional standards, and funding agencies including the South Coast Air Quality Management District provided incentive monies to encourage deployment of natural gas powered heavy-duty vehicles.

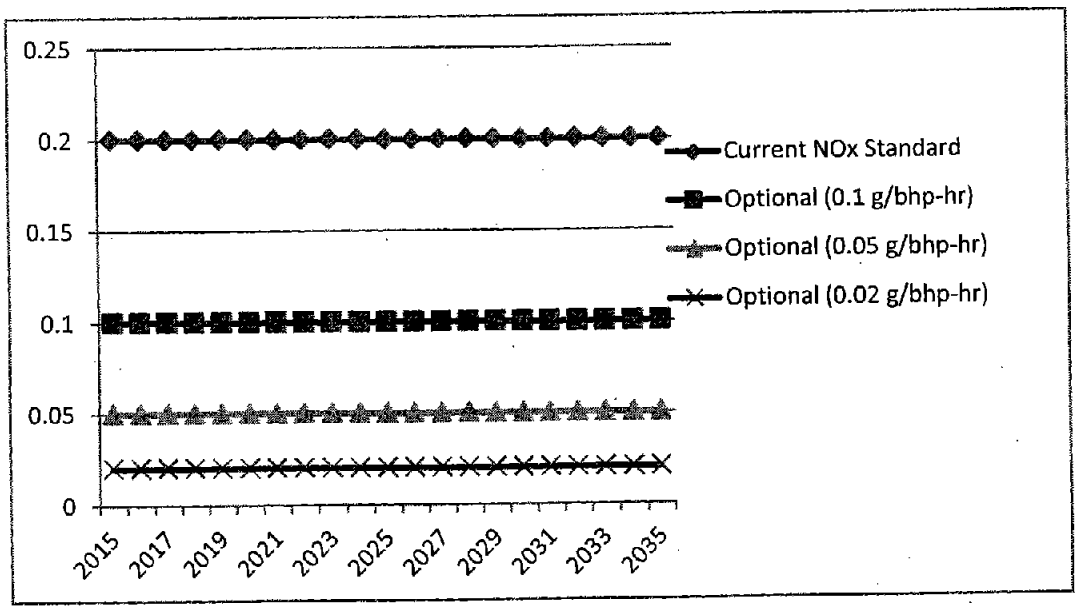
The remainder of this section provides details of staff's proposal for a new round of optional NOx emissions standards. Section 2 provides a summary of the proposed voluntary standards, Section 3 reviews technological feasibility, Section 4 discusses the environmental impacts of the proposed

optional standards, Section 5 estimates the cost of the proposal, Section 6 discusses regulatory alternatives that were considered but rejected in favor of the proposed standards, and Section 7 discusses a number of issues that arose during development of the proposed standards.

2. Summary of Proposed Voluntary Standards

The proposed regulation establishes three optional NOx emission standards for heavy-duty engines, as shown in Figure 5. The proposed standards are 0.1 g/bhp-hr, 0.05 g/bhp-hr, and 0.02 g/bhp-hr. Manufacturers can elect to certify to any of the optional NOx standards or to instead certify to the existing mandatory 0.2 g/bhp-hr NOx standard.

Figure 5 - Optional NOx Engine Emission Standards (g/bhp-hr)



The test procedures associated with the proposed optional standards are set forth in "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines" and "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as incorporated by reference in 13 CCR 1956.8 (CCR, 2013). On-board diagnostic requirements for the optional standards are discussed in both the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines" and California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles" and in 13 CCR 1971.1 and 1971.5.

The proposed optional standards are designed to achieve some near-term, as well as long-term emission benefits resulting from new heavy-duty engines with near-zero NOx emissions. This proposal is intended to incentivize manufacturers to develop engines with lower NOx emissions, which would help California meet its obligations to improve ambient air quality and meet its SIP commitments.

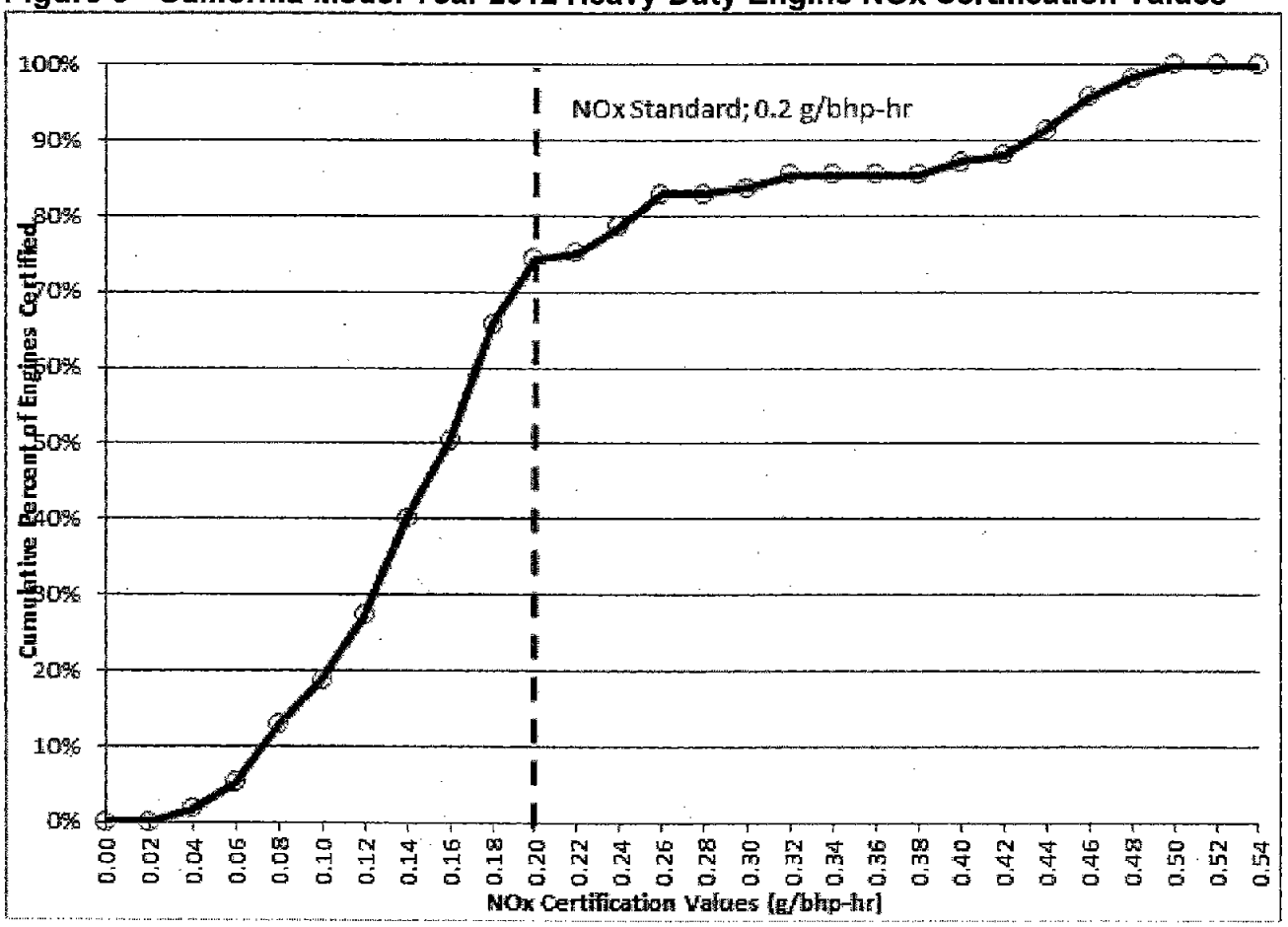
3. Technical Feasibility

As discussed below, staff believes that the optional low NOx emission standards are technically feasible. However, other factors prevent staff from proposing mandatory NOx standards at this time. Such factors include cost and fully demonstrating the durability of the emission control technologies needed to achieve the lower NOx levels. However, given the proper incentives, staff believes that some manufacturers will "rise to the occasion," as they have in the past, and produce complying products.

a. Certification Levels

A number of existing certified heavy-duty engines have certification levels, (i.e., the emission level at the end of the required testing period for certification) that are at or below the proposed optional levels. While this is in itself noteworthy, manufacturers typically certify to levels below the standard (with a "compliance margin") to provide them assurance that the engine will comply with the standard for its useful life. Compliance margins vary by manufacturer and engine, but a compliance margin of 50 percent below the standard is common.

Figure 6 - California Model Year 2012 Heavy-Duty Engine NOx Certification Values



As shown in Figure 6, over 70 percent of MY 2012 engines are certifying below the current 0.2 g/bhp-hr standard. About 8 percent of the MY 2012 engines are already certifying at levels 30 percent or more below the optional 0.1 g/bhp-hr standard, at 0.03 to 0.07 g/bhp-hr. See Appendix IV for a summary of certification data for engines with certification levels below the current 0.2 g/bhp-hr NOx standard.

b. Advances in Heavy-Duty Engine Technology

There have been major advances in heavy-duty engine technology to meet the current 0.2 g/bhp-hr standard, and staff believes it likely that

such progress will continue, particularly with the existence of the optional standards and the widespread knowledge of California's need for lower-NOx heavy-duty engines. Some technologies that could enable manufacturers to meet the optional levels are described briefly below. Staff is confident that advances or expanded use of one or more of the technologies described below will enable manufacturers to certify to the optional NOx standards.

i. **Cooled EGR**
EGR is one of the most effective methods of reducing NOx emissions at low levels. Spent combustion gasses recirculated back into the intake system serve as a diluent to lower the oxygen concentration and also increase the heat capacity of the air/fuel charge. Cooled EGR, (cooled through the aftercooler) is used to minimize combustion temperatures. This reduces peak combustion temperatures and the rate of combustion, thus reducing NOx emissions.

ii. **EGR By-Pass Valve**
An EGR by-pass valve routes the exhaust gasses around the EGR cooler to achieve the desired temperature for reduced emissions and optimum engine performance.

iii. **Low and High Pressure EGR**
New turbocharger design and turbine blade coatings are providing the opportunity for low and high pressure EGR. The new turbocharger design and coatings allow exhaust gasses to pass through the turbocharger, providing engine designers with more mixing opportunities to mix fresh and exhaust gasses thereby reducing emissions and improving fuel economy and engine response.

iv. **Close Coupled Catalysts**
One way to reduce high emissions at cold start is to physically locate the catalyst closer to the exhaust manifold. Moving the catalyst closer to the hot exhaust manifold will heat up the catalyst faster, thereby reducing cold start emissions.

v. **Dual Wall Pipes and Exhaust Pipe Insulation**
Dual wall and exhaust pipe insulation insulates the exhaust gas, allowing hotter exhaust temperatures to reach the catalyst, thereby helping reduce emissions during cold start conditions.

vi. **NOx Exhaust After-treatment**
The above technologies by themselves are unlikely to enable manufacturer to meet the low NOx standards being proposed. Engines currently being certified to low levels tend be natural gas

engines with a three-way catalyst, but there are also some very clean diesel engines that use SCR, DPF, and EGR or enhanced EGR. This is a reasonable starting point for others wishing to pursue the low NOx standard, but these approaches may not be suitable for all engines and all duty cycles. Further reductions in NOx emission levels could be achieved through fine-tuning of current SCR systems, close-coupling the SCR system to the engine, adding a passive lean NOx filter to a DPF/SCR system, switching to ammonia from urea and improving delivery metering and responsiveness (ammonia starts controlling NOx at lower temperatures than does urea.), improving catalysts or catalyst efficiency, increasing the coating on the SCR catalysts, and increasing filter volume. Using multi-metal zeolite catalysts or vanadia-based catalysts or improving other NOx adsorption approaches (NOx trap system, or lean NOx trap (LNT)) to trap NOx formed at low operating temperatures experienced before the engine is fully warmed up or during low load operations will help to further reduce NOx over the entire duty cycle.

vii. **Homogeneous Charge Compression Ignition**

Lawrence Livermore National Laboratory recently completed a project to develop homogeneous charge compression ignition (HCCI) engines that emit only 0.015 g/bhp-hr NOx. HCCI technology uses thermal auto ignition of a premixed air/fuel mixture with no flame propagation. This results in a low combustion temperature, and very low NOx emissions. The technology shares some characteristics of traditional gasoline-powered engines and other characteristics of traditional diesel-powered engines.

viii. **Natural Gas**

Very low NOx levels can be achieved by natural gas-powered engines. In fact, staff expects heavy-duty natural gas engines to be the primary technology used to meet the proposed optional 0.05 g/bhp-hr and 0.02 g/bhp-hr NOx standards, at least initially.

Current technology for heavy-duty natural gas engines has enabled natural gas engines to approach diesel-like fuel economy and performance, while emitting less NOx and PM emissions compared to diesel engines (Wisconsin, 2013).

There are two main methods for allowing natural gas engines to operate with very low NOx emissions - lean burn combustion and stoichiometric combustion with exhaust after-treatment. Under lean burn combustion, excess air is introduced into the combustion chamber with the fuel; the excess air reduces the combustion chamber temperature and thereby reduces NOx production (Cummins, 2007). Stoichiometric engines are designed to burn the air and fuel mixture

completely with the use of an external combustion source such as a spark plug. Typically, exhaust after-treatment for stoichiometric engines includes a three-way catalyst (TWC) and EGR (Cummins, 2012).

Examination of current certification levels for natural gas versus diesel engines illustrates how natural gas engines are currently achieving lower NOx levels than diesel engines. For MY 2012, of the 23 engine families with California NOx certification levels less than 0.1 g/bhp-hr, 11 are powered by natural gas engines equipped with a TWC, whereas only three are powered by diesel engines.

c. Current Low NOx Demonstration Projects

As enumerated below, a number of current demonstration projects evaluating technologies have a goal of achieving NOx emissions lower than the current standard.

i. ARB Low NOx Research Project

Evaluating Technologies and Methods to Lower Nitrogen Oxide Emissions from Heavy-Duty Vehicles

This is a $1.6 million project involving two heavy-duty engines: one stoichiometric natural gas engine with a three-way catalyst, and one diesel engine with SCR. The project is currently under way, with a goal to demonstrate the feasibility of a 0.02 g/bhp-hr NOx standard. The completion date for the project is projected to be late 2015 (ARB, 2013b).

ii. South Coast Air Quality Management District (SCAQMD) Research Project

Low NOx Engine Demonstration

This project focuses on engine and after-treatment technology that has the potential to attain a 0.02 g/bhp-hr NOx emission level and that can be put "on the road" in commercial service soon after completion of the project. The project is expected to begin by December 2013, and be completed by the end of 2016 (SCAQMD, 2013).

iii. Southern California Gas Company (SCGC) Projects

Next Generation Refuse/Transit

Three refuse vehicles with near-zero emission natural gas engines are currently in the planning stage. The goal is to achieve a 75 percent NOx reduction while keeping the cost and efficiency the same as diesel. The plan is to modify 11 liter Doosan engines with SCR, stoichiometric operation, three-way catalyst, cool exhaust gas

recirculation, advanced ignition system and improved turbo efficiency. On-road testing is scheduled to start in late 2014 (SCGC, 2013).

Low Emission Turbine Drive
The goal of this project is to demonstrate a Class 8 truck with an existing 350 kW gas turbine engine to emit near-zero emissions using a dual liquid/natural gas combustor. The project aims to keep NOx less than 0.05 g/bhp-hr and CO at or below 0.02 g/bhp-hr. The initial chassis testing started in July 2013, and truck chassis testing is scheduled for late 2013 (SCGC, 2013).

4. Environmental Impacts Analysis

This section provides an environmental analysis for the proposed optional NOx emissions standards regulation. Based on staff's review, staff has determined that implementing the proposed optional NOx standards would not result in any potentially significant adverse impacts on the environment. This analysis provides the basis for reaching this conclusion. This section of the staff report also discusses environmental benefits expected from implementing the proposed regulation.

a. Methods of Compliance

The proposed optional low NOx emission standards are completely optional, and hence there are no mandatory compliance responses. Engine manufacturers could choose to certify to the proposed optional standards beginning with MY 2015. As discussed further in section C.7.c. below, manufacturers that choose to certify engines to the proposed optional standards would need to meet ARB's on-board diagnostics (OBD) requirements as well. More detailed information on the technologies likely to be used by the regulated community to meet the optional standards can be found in section C.3 above.

b. Beneficial Impacts

The proposed optional standards are voluntary in nature and do not require any compliance response. To the extent that the regulated community chooses to certify to the proposed optional standards and build and deploy lower-emitting engines, NOx emissions will be reduced, resulting in air quality benefits. Certifying to low NOx levels would enable manufacturers to have a more complete product line, and, for marketing purposes, advertise their environmental performance. Trucks with engines certified to the proposed optional low NOx standards could be attractive to truck buyers interested in government clean air incentive monies, as discussed further in subsection 7 below.

As discussed further below, staff estimates NOx emission benefits of 0.6 to 1.2 TPD in 2020, and 3.3 to 6.9 TPD in 2035 could result from the

proposed optional standards. Such NOx emission reductions are needed to attain federal air quality standards, and lessen the localized impacts to public health and the environment directly related to NOx emissions.

To estimate the emission reductions that could result from the proposed optional standards, staff estimated the percent of new engines that manufacturers will choose to certify to the proposed standards. Because it is unknown to what extent manufacturers will choose to certify to the optional standards, staff evaluated two bounding scenarios, a high adoption rate scenario and a low adoption rate scenario. The two adoption scenarios are shown in Table 9 for 2015 through 2035 MYs.

The high adoption scenario was an optimistic scenario, where low emission NOx engines would be offered starting in 2015 and their market penetration would increase steadily over the years. In the high adoption scenario, staff assumed eight percent of 2015 MY vehicles would certify to the 0.1 g/bhp-hr standard. The eight percent was based on examination of MY 2012 certification data, presented above in Figure 6, where approximately 8 percent of MY 2012 vehicles had certification levels below 0.07 g/bhp-hr and so were assumed to be promising candidates for meeting the 0.1 g/bhp-hr standard. For each scenario, staff chose an annual increase in certifications to the optional low NOx standards of 5 percent per year from 2015 through the 2035 MY.

The low adoption scenario is meant to represent relatively low engine manufacturer participation. The low adoption scenario assumes that only four percent of new engines sold in California will certify to the 0.10 g/bhp-hr standard in MY 2015. Certifications to the 0.05 g/bhp-hr optional standard would be delayed until the 2020 MY. No certifications at the 0.02 g/bhp-hr optional standard are assumed.

Table 9 - Percent of Heavy Duty Engines Projected to Meet the Proposed Optional Low NO Standards

Estimated High Adoption Scenario

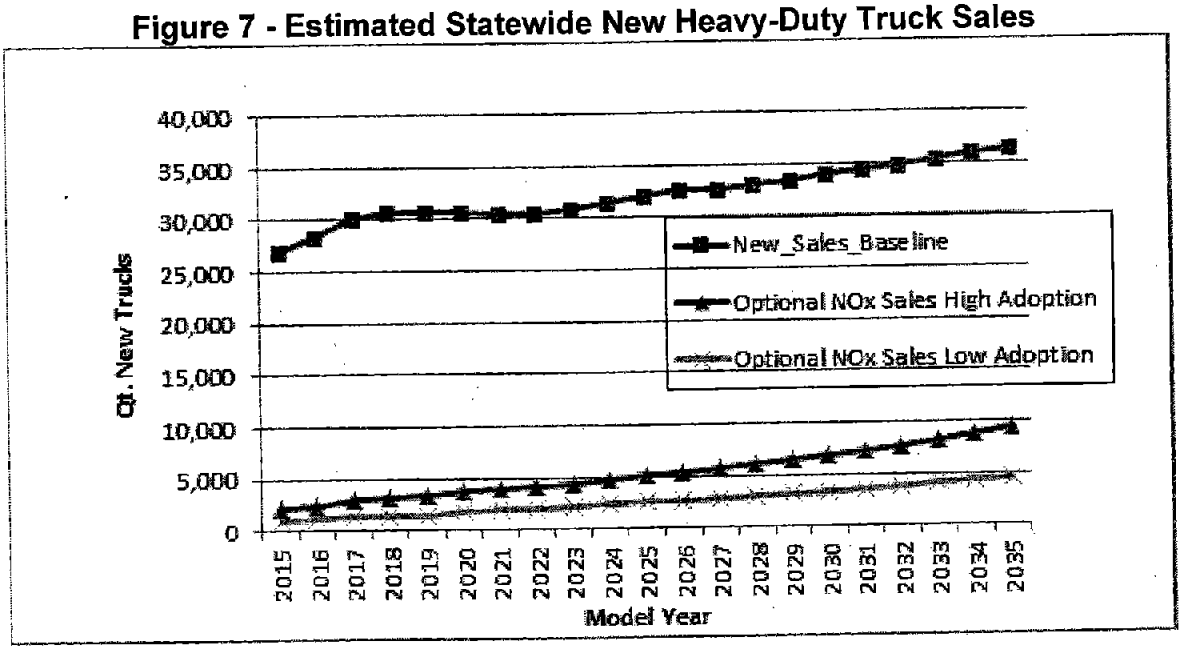
Optional Low NOx Standard	% 2015	% 2016	% 2017	% 2018	% 2019	% 2020	% 2021	% 2022	% 2023	% 2024	% 2025	% 2026	% 2027	% 2028	% 2029	% 2030	
0.10	8.0	8.4	8.8	9.3	9.7	10.2	10.7	11.3	11.8	12.4	13.0	13.7	14.4	15.1	15.8	16.6	17
0.05	0	0	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.5	1.6	1.6	1.7	1.8	1.9	2.(
0.02	0	0	0	0	0	1.0	1.1	1.2	1.2	1.2	1.3	1.3	1.4	1.5	1.6	1.6	1.7
Total	8.0	8.4	9.8	10.3	10.8	12.4	13.0	13.6	14.3	15.0	15.8	16.6	17.4	18.3	19.2	20.1	21

Estimated Low Adoption Scenario

Optional Low NOx Standard	% 2015	% 2016	% 2017	% 2018	% 2019	% 2020	% 2021	% 2022	% 2023	% 2024	% 2025	% 2026	% 2027	% 2028	% 2029	% 2030	
0.10	4.0	4.2	4.4	4.6	4.9	5.1	5.4	5.6	5.9	6.2	6.5	6.8	7.2	7.5	7.9	8.3	8.7
0.05	0.0	0.0	0.0	0.0	0.0	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.5	1.6	1.6	1.7
0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	4.0	4.2	4.4	4.6	4.9	6.1	6.4	6.7	7.1	7.4	7.8	8.2	8.6	9.0	9.5	9.9	10

Figure 7 below shows the projected increase in California heavy-duty truck sales through 2035 based on the EMFAC 2011 model, along with the two adoption scenarios modeled. As can be seen, after a level period from 2017 through 2022 MY, truck sales are expected to continue to increase annually through 2035. By 2035, between 13 and 26 percent of these new heavy-duty vehicles are anticipated to have optional low NOx engines installed.

Figure 7 - Estimated Statewide New Heavy-Duty Truck Sales



Appendix III provides further detail on the methodology used to estimate emission benefits.

c. Resource Areas with No Impacts

Staff concludes that implementation of the proposed optional standards would not result in any significant adverse impacts on the environment. The proposed amendments are optional and would not require any activity that could result in a physical change to the existing environment. The proposed amendments would encourage engine manufacturers to deploy new technologies and certify their engines to the optional low NOx standards.

Should engine manufacturers choose the option to pursue new NOx emission reduction technologies, it is anticipated that no new facilities will need to be constructed, no existing facilities will need to be expanded beyond their current capacity, and no significant changes in the operation of existing facilities is likely to occur. Therefore, the proposed amendments would not require any action by regulated parties that could adversely affect the following resource areas: aesthetics, air quality, agricultural and forestry resources, biological resources, cultural

resources, geology and soils, greenhouse gases, hazardous material, hydrology and water quality, land use planning, mineral resources, noise, population and housing, public services, recreation, or traffic and transportation, and utilities and service systems.

As discussed above in section 3, staff expects natural gas engines to be the primary technology used to meet the proposed optional 0.05 g/bhp-hr and 0.02 g/bhp-hr NOx standards, at least initially (although it is possible that some diesel-powered engines may certify to these levels as well). In turn, clean air incentive programs that provide funding to engines certified to the optional standards may encourage greater deployment of natural gas powered heavy-duty vehicles in California. Greater deployment of natural gas-powered trucks could then in turn lead to additional natural gas use and production which has methane emissions associated with its production, transport, and distribution. However, any significant increase in the use of natural gas trucks, and hence increase in methane emissions from natural gas use and production, would be driven by a variety of factors in including economics, market dynamics, and market incentives that would occur with or without ARB's proposed optional standards. Hence, staff concludes it is too speculative to determine whether any potential increase in methane emissions would result from a potential greater deployment of natural gas engines that meet the optional NOx standards.

No discussion of alternatives or mitigation measures is necessary because no significant adverse environmental impacts were identified.

5. Economic Impact Assessment/Cost Analysis

The following economic impact assessment/cost analysis has been prepared for this rulemaking action in accordance with the provisions of Government Code section 11346.3b(1)(A)-(D).

This section discusses the estimated costs associated with implementation of the optional low NOx standards. The expected capital and recurring costs for potential compliance options, the cost and associated economic impacts on businesses, as well as an analysis of the cost-effectiveness of the proposed regulation are presented. Estimates in this section are based on the costs incurred and emissions reductions expected during the years 2015 to 2035. Generally, costs contained in this section are in 2013 dollars.

Even though the proposed standards would be optional, to the extent manufacturers choose to certify to the standards, there would be costs. Under the high adoption scenario, more of these costs would be incurred than under the low adoption scenario, but additional benefits would also be achieved.

a. Creation or Elimination of Jobs and Effect on New and Existing Businesses within the State

Any business that is involved in manufacturing on-road heavy-duty engines may be affected by the proposed optional low NOx emission standards. ARB has identified about 35 such engine manufacturers with California certified on-road engines.

The proposed standards are not expected to either create or eliminate jobs or businesses in California. Additional businesses could be created to manufacture technologies to help reduce NOx emissions from heavy-duty engines, but the number of such potential new businesses cannot be quantified at this time. To the extent that manufacturers opt to comply using technologies currently manufactured in California, California businesses may be able to expand their operations. No significant impacts to the competitive advantages or disadvantages for businesses currently doing business within the state are anticipated

b. Estimated Costs to Engine Manufacturers

Although costs would be incurred if a manufacturer chooses to certify an optional low NOx engine, it is difficult to quantify these costs because the cost varies significantly depending on the starting point of the particular engine. If the engine is already meeting the optional low NOx 0.1 g/bhp-hr emission standard, as is seen for around eight percent of current certifications, the costs are largely limited to confirmatory testing to ensure compliance and reporting costs. Such testing and reporting would be expected to cost $10,000 to 30,000 per engine family (Olson-EcoLogic, 2013). However, some redesign is likely to be required for the lowest optional low NOx standard. If an engine redesign is required, costs may exceed $500,000. These costs would be spread over all engines sold in that engine family. For manufacturers not choosing to comply with the optional standards, there will be no additional monetary cost.

For those engines not already meeting the standards, discussions with interested parties indicate that the initial standards could be achieved at a cost of hundreds of dollars per engine for natural gas to thousands of dollars per engine for diesel.

An example of how the costs were estimated for 2035 under the low adoption scenario is shown below:

In 2035, 12.69% of the new sales fleet of 36,424 engines certify to the optional standards, resulting in sales of 4,623 Low NOx engines. Manufacturer-submitted 2012 model year engine family data and projected sales volumes were used to identify NOx levels by engine family. Projected sales of each engine family were adjusted to actual

sales using an overall ratio of total projected sales of all engine families to actual sales of all engine families. These sales were then grown to the 2035 model year using EMFAC2011. Thus, the 1,048 adjusted sales of two low NOx gasoline engine families were grown to 1,936 engines in 2035. These engines could likely certify under this program for little or no additional per engine cost. Projected sales of an engine family with reported emissions of 0.09 g/bhp-hr NOx were adjusted to sales of 497 in 2035. It was estimated that these engines would require up to $1,000 in additional technology for certification at 0.10 g/bhp-hr NOx. The remaining 2,190 engines were drawn from those with currently reported NOx levels of 0.1 g/bhp-hr through 0.14 g/bhp-hr. These engines were assumed to require up to $3,500 in additional technology. Thus, the total cost estimated for 2035 under this low adoption scenario is:

$$1{,}048*\$0 + 497*\$1{,}000 + 2{,}190 * \$3{,}500 = \$8{,}162{,}000$$

Based on assumed participation in 2035 of 12.7 to 25.7 percent of the fleet, 2035 sales of 36,424 engines, and costs varying between $500 and $10,000 per engine, this corresponds to a total cost of $36 to 279 million over 20 years fleet-wide. In 2035 costs were estimated to range from $6 to $35 million, which when combined with estimated 2035 benefit of 3.3 to 6.9 TPD NOx, yields a cost-effectiveness of between $2 and $7/pound NOx reduced (i.e., between $5,000 and $14,000/ton NOx). This cost-effectiveness is well within the range of cost-effectiveness of mandatory measures that ARB has adopted in the past and below the cost-effectiveness threshold used for funding of Carl Moyer program projects.

Based on the assumed annual participation rates, staff has estimated that manufacturers would incur hardware costs ranging from $0 to $6,000 per engine to modify engines to meet the low optional NOx standard, plus certification costs of approximately $20,000 per engine family, with the anticipated cumulative cost for the fleet over the 20 year life of the regulation estimated at $36 to $279 million. Re-certifications of existing technology for future MYs should not result in any additional testing or reporting costs beyond those that would be incurred to certify engines not participating in the program. Overall, because the program is optional, it is not anticipated to have significant costs to manufacturers because a projected cost that is overly onerous would result in a business decision to not participate in the program.

6. Regulatory Alternatives

Staff evaluated various alternatives to the proposed optional standards. A brief description of the alternatives and staff's reasoning for rejecting them in favor of staff's proposal follows. The first alternative entails not adopting any optional low NOx standard, the second and third are alternative forms of the

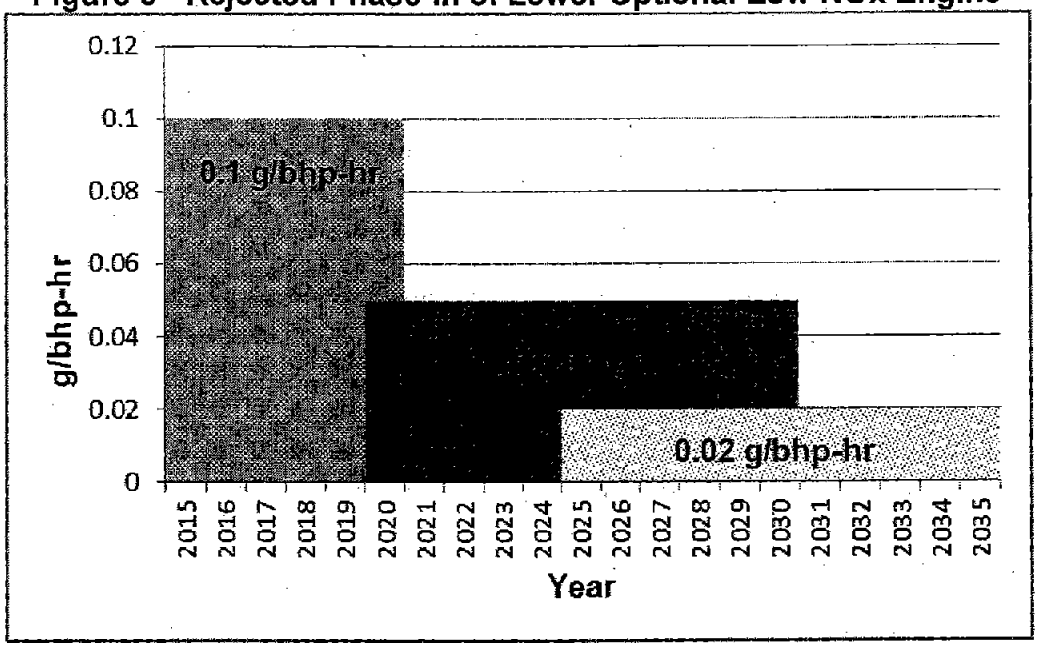
optional NOx standard, and the fourth includes additional provisions that could be included in an optional NOx standard.

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 the affected private persons than the proposed optional standards.

a. **No Action**
Staff considered a no action alternative under which no optional low-NOx standards for heavy-duty engines would be proposed. However, as described in Chapter II, the state has a great need for NOx reductions, which means an even cleaner generation of heavy-duty diesel engines beyond engines meeting the current 0.2 g/bhp-hr standard is needed. Staff envisions the optional NOx emission engine standards as a way to usher in this next generation of lower NOx engines and help demonstrate the feasibility of future lower mandatory standards. Hence, staff rejected the no action alternative.

b. **Propose Three Optional Low NOx Standards to Start, but Phase Out the Higher Optional Levels Over Time**
As shown in Figure 8, instead of proposing three standards that are constant over time, staff could propose three standards but after a few years phase out the highest standard (0.1 g/bhp-hr) and possibly phase out the 0.05 g/bhp-hr level later as well. Disadvantages of phasing out the highest standard include the risk of reducing participation in the overall voluntary standard program. For example, if an engine manufacturer's engine could meet the 0.1 g/bhp-hr standard but not the 0.05 g/bhp-hr standard, there would be less incentive to certify to the 0.1 g/bhp-hr standard with its finite lifetime.

Figure 8 - Rejected Phase-In of Lower Optional Low NOx Engine



c. Propose Only One or Two Lower NOx Engine Standards

Staff could propose only one optional lower NOx engine emission standard, or two standards, rather than the three proposed optional standards. During the workshop for the proposed optional NOx standards, representatives from the SCAQMD advocated, for example, proposing just two optional NOx standards – 0.05 g/bhp-hr, and 0.02 g/bhp-hr. Having only two or just one optional standard would be simpler than the proposed three standards.

However, because of the uncertainty about what NOx emissions standards are achievable, the desire to provide an incentive for manufacturers to certify to lower and lower NOx standards over time, and the desire to allow both natural gas and diesel engine manufacturers to participate, staff recommends the proposed three standards. If there were just one optional standard at 0.1 g/bhp-hr (50 percent below the current standard), for example, once manufacturers had produced an engine certified to 0.1 g/bhp-hr, there would be no incentive to go further. If there were just one optional standard at 0.02 g/bhp-hr (90 percent below the current standard), it is possible that for many years, no manufacturers would certify to the optional standard, because achieving it would pose such a technical challenge compared to certifying to the mandatory 0.2 g/bhp-hr standard. With three standards, manufacturers could initially aim for the 0.1 g/bhp-hr standard and then in future years aim to achieve the 0.05 and then the 0.02 g/bhp-hr standard. In addition, as discussed above in section 3, staff expects diesel engine manufacturers to have a relatively difficult time meeting the proposed optional standards as compared to natural gas engine manufacturers. If staff proposed only the 0.02 g/bhp-hr standard or only the 0.02 and 0.05 g/bhp-hr standards, it is possible that

only natural gas engines would be able to meet the standards, and staff would forego the opportunity to encourage the development and certification of lower-NOx diesel engines.

d. Include an Optional Warranty to the Optional Low NOx Engine Emission Standards

As discussed at the March 11, 2013, workshop, staff originally considered including an optional warranty along with the optional low NOx engine emission standards. The current warranty for a heavy-duty engine is 5 years or 100,000 miles. Staff considered proposing an optional warranty of 5 years and 250,000 miles. This optional warranty would have provided an opportunity for engine manufacturers to ensure the extra emission reductions offered by the optional low NOx engine emission standards would remain in effect for much of the life of the engine. Staff decided that meeting an optional warranty would not likely be attractive to engine manufacturers and could reduce overall participation in the optional NOx standards program, and that it was more important to encourage manufacturers to certify to the optional standards, at least initially, than to require them to meet greater warranty commitments.

A discussion of possible longer warranty periods for future mandatory standards is included below in subsection 7.

7. Issues

This section discusses several issues that arose during development of the optional low NOx standard proposal. Subsection a addresses concerns over whether current measurement techniques are adequate to certify engines down to the proposed optional NOx standards. Subsection b discusses concerns over whether current warranty periods for heavy-duty engines are too short and explains why staff opted not to include a longer warranty period as part of the optional standards.

One of the most critical issues staff considered during development of the optional low NOx standards was what incentives could be provided for manufacturers that choose to certify to them. As described above in section 4, the optional low NOx standards will only provide emission benefits and pave the way for future cleaner engines if manufacturers choose to certify to them. Subsections c through f discuss existing programs that provide some incentive for optionally certified engines and offer potential ways those programs could be modified to provide further incentives.

a. Emission Calibration/Analysis

Current certification emission measurements are adequate to measure NOx levels down to the proposed optional low NOx emission standards for heavy-duty engines, but improvements in instrumentation to increase its sensitivity, specificity and linearity over a wide NOx dynamic range would make such measurements more robust. Staff evaluated this issue after several stakeholders expressed concern that the optional low NOx emission limits proposed by staff, particularly the lowest 0.02 g/bhp-hr level, are extremely low and could challenge current laboratory instrumentation.

Measuring NOx emissions has been and will continue to be performed by following the procedures in 40 CFR 1065.270 (CFR, 2013). These procedures require NOx emissions to be measured with a chemiluminescence detector (CLD). Typical CLD measurements are in the 0 to 10 parts per million (ppm) range. For reference, a 500 horsepower diesel engine emitting 0.02 g/bhp-hr NOx would have an exhaust concentration of about 1.41 ppm[12], which is well within the range of a standard CLD instrument.

As evidence that current emission measurement techniques are adequate to certify engines to levels as low as 0.02 g/bhp-hr, some engines are already certified at comparable levels. For example, a 2013 MY engine was recently certified to a level of 0.01 g/bhp-hr (Executive Order DGKTE06.8FM1, 2013). In addition, twenty-five 2009 to 2012 engines were certified at levels between 0.03 and 0.05 g/bhp-hr, further demonstrating that low NOx instrumentation detection is achievable

[12] (Yorke, 2008) basic conversion of g/bhp-hr to ppm (g/bhp-hr*70.6).

b. Longer Engine Warranty

The current required heavy-duty engine warranty is 5 years or 100,000 miles. Mileage accrual data indicate that heavy-duty vehicles typically travel 100,000 miles in their first year of operation, accruing between 500,000 and 600,000 miles by the end of their fifth year (ARB, 2013e). This means that heavy-duty vehicles effectively exceed their warranty coverage in one year (i.e., the current required 5 year/100,000 mile warranty is effectively a 1 year/100,000 mile warranty).

To encourage participation in the optional NOx standard program, staff decided to forgo requiring extended warranty coverage to provide engine manufacturers more time to focus on NOx emission reduction technologies. However, for future mandatory standards, staff anticipates proposing requiring warranty coverage beyond 100,000 miles, potentially to 5 years or 250,000 miles.

c. On-Board Diagnostics

OBD systems utilize software designed into the vehicle's on-board computer to detect emission control system malfunctions as they occur by monitoring virtually every component and system that can cause an increase in emissions. When an emission-related malfunction is detected, the OBD system alerts the vehicle owner by illuminating the malfunction indicator light (MIL) on the instrument panel. By alerting the owner of malfunctions as they occur, repairs can be sought promptly, which results in lower emissions from the vehicle. Additionally, the OBD system stores important information, including identification of the faulty component or systems and the nature of the fault, which allows for quick diagnosis and proper repair of the problems by technicians. This helps owners achieve less expensive repairs and provides greater assurance that the repairs are done correctly the first time.

Passenger cars, light-duty trucks, and medium-duty vehicles and engines have been required to be equipped with OBD systems since MY 1996 (referred to as OBD II). Requirements for OBD systems on heavy-duty vehicles have taken effect more recently, as emission standards for heavy-duty vehicles have begun to require after-treatment systems. Such after-treatment systems require monitoring to ensure low emissions are maintained in-use and for the life of the vehicle.

Beginning with the 2007 MY, ARB required some diagnostic systems for heavy-duty engine emission controls. Specifically, the Engine Manufacturer Diagnostic (EMD) system regulation, as in 13 CCR 1971, requires heavy-duty engine manufacturers to implement diagnostic systems on all 2007 and subsequent MY on-road heavy-duty Otto-cycle (gasoline) and diesel engines (CCR, 2013). However, the EMD regulation

is much less comprehensive in comparison to the OBD II regulation, containing no standardized requirements and requiring rudimentary monitoring of just a few systems.

In 2005, ARB adopted comprehensive OBD requirements for heavy-duty engines, seen in 13 CCR 1971.1 (CCR, 2013). The heavy-duty OBD requirements began phasing in with MY 2010 and are scheduled to be fully phased in on all heavy-duty engines by the 2016 MY. The heavy-duty OBD requirements include monitoring of all emission-related systems and components and both emission threshold-based monitoring (i.e., detection of a component/system fault before a specific emission level is exceeded) and non-emission threshold-based monitoring. For the most important emission control systems such as the PM filter and SCR system, the regulation specifies malfunction criteria and emission thresholds for detecting a malfunction and illuminating the MIL based on emission increases (defined by additive and multiplicative factors) relative to the emission standard. For example, on 2016 and subsequent MY engines, the OBD system must be designed to detect an SCR catalyst malfunction when the catalyst conversion capability has deteriorated to the point that the engine's emissions are exceeding the NOx standard by more than 0.2 g/bhp-hr (e.g., cause emissions to exceed 0.4 g/bhp-hr if the exhaust emission standard is 0.2 g/bhp-hr). Using EGR as another example, the OBD system must be designed to detect an EGR system malfunction when the EGR flow rate has decreased to the point that NMHC, CO, or NOx emissions are exceeding 2.0 times any of the applicable standards, or PM emissions are exceeding the applicable PM standard by more than 0.02 g/bhp-hr.

For heavy-duty engines certified to the optional low NOx emission standards, staff is proposing that manufacturers meet the OBD requirements for heavy-duty engines as seen in 13 CCR 1971.1 and monitor for the same types of malfunctions, but with some added flexibility for defining the emission thresholds (CCR, 2013). Because the emission thresholds are often defined as a multiple of the emission standard (e.g., 2.0 times the standard for the EGR malfunction example above), if staff proposed full compliance with 13 CCR 1971.1, the required emission thresholds for detecting faults with respect to absolute emission levels would be lower, and as such more stringent, for engines certified to the optional standards than for engines certified to the mandatory 0.2 g/bhp-hr NOx standard. Engine manufacturers' current sensors and OBD system technologies may not be able to reliably detect faults at such low absolute emission levels. In recognition of the added challenge of monitoring at these lower emission levels, staff's proposal includes the ability for manufacturers to seek approval from the Executive Officer to use alternate emission thresholds that are determined by the manufacturer. In determining the emission thresholds and in order to obtain Executive

Officer approval, the manufacturer would be required to use the best available monitoring technology to design its monitors to detect malfunctions at the lowest feasible tailpipe emission levels while concurrently preventing incorrect malfunction detection of components that are still within their useful life performance specifications (i.e., components that are still "good parts"). Further, manufacturers would have to ensure the monitors execute frequently during typical in-use vehicle operating conditions so malfunctions would be detected within an appropriate time frame. Lastly, the manufacturer would have to provide emission data showing the fault detection below the proposed thresholds. Staff's proposal also includes a process of designing and calibrating the monitors to detect at the lowest feasible emission levels. Specifically, the manufacturer would not have to set the malfunction criteria below the emission thresholds specified for each monitor in section 1971.1 except for additive NOx malfunction criteria (e.g., NOx standard plus 0.2 g/bhp-hr), in which case the malfunction criteria may not be lower than 2.0 times the applicable NOx standard. The process outlined above is the same as the one manufacturers follow today when designing monitors to meet the existing OBD regulations for engines certified to the 0.2 g/bhp-hr NOx standard.

Some manufacturers have expressed concerns that this proposal does not provide an OBD design target and that ARB may end up not allowing manufacturers to use these provisions during certification. Staff believes these concerns are unfounded given that similar provisions exist in the current OBD regulations. The heavy-duty OBD regulation, as seen in 13 CCR 1971.1(g), currently includes an allowance for ARB to revise the emission threshold for any monitor if "the most reliable monitoring method developed requires a higher threshold to prevent false indications of a malfunction" (CCR, 2013). Further, section (f)(17.1.5) of the OBD II regulation, seen in 13 CCR 1968.2, has provisions similar to those staff is proposing here (CCR, 2013). The provisions in the OBD II regulation allow engine manufacturers certifying medium-duty diesel vehicles to a chassis dynamometer tailpipe emission standard to propose emission thresholds based on the monitoring requirements defined for medium-duty diesel engines certified to an engine dynamometer tailpipe emission standard. These provisions in the OBD II regulation were used by engine manufacturers during the phase-in and early years of the 0.2 g/bhp-hr NOx emission standards. Staff's OBD proposal would allow manufacturers to take their current and best OBD practices and apply them to the lower NOx engines. Staff believes its OBD proposal for the lower NOx standards would provide enough flexibility to manufacturers to certify to the heavy-duty OBD requirements and would encourage development and improvement of these systems. It is staff's intent that the proposed OBD requirements will not deter manufacturers from certifying engines to the optional lower NOx standards.

d. Carl Moyer Memorial Air Quality Standards Attainment Program

The Carl Moyer Program is a grant program that funds the incremental cost of cleaner-than-required engines, equipment, and other sources of air pollution. The Carl Moyer Program complements California's regulatory program by providing incentives to obtain early or extra emission reductions, especially from emission sources in environmental justice communities and areas disproportionately impacted by air pollution. The Carl Moyer Program can fund replacement of older vehicles as well as new vehicle purchases.

In order to receive Carl Moyer Program funding, each project must meet the specified maximum cost-effectiveness limit (ARB, 2011). To calculate Carl Moyer Program cost-effectiveness, the project grant amount is annualized based upon the project's life and an appropriate discount rate. This annual cost is divided by the project's estimated emission reductions to determine the overall cost-effectiveness of the covered emissions reduced.

Under the current guidelines, the Carl Moyer Program could fund a vehicle with an optional low NOx-certified engine either as a vehicle replacement or as a new vehicle purchase project (ARB, 2011). However, given the current guidelines, the funding available for a vehicle with an optional low NOx-certified engine is likely not enough to provide adequate incentive for many fleets to purchase such vehicles.

As shown in Table 10, replacing an old vehicle with one with an optional low NOx-certified engine would provide the same or only slightly more possible funding than replacing it with a vehicle with an engine certified to the mandatory standard of 0.2 g/bhp-hr. Also shown in Table 10, the Carl Moyer Program could currently provide some funding for the new purchase of a vehicle with an optional low NOx-certified engine (when not replacing an old truck). The maximum funding available for such a new vehicle purchase would range from about $3,000 to about $5,000, which is unlikely to be sufficient incentive for purchase of such a vehicle.

Based on the example amounts in Table 10, it is clear that, although the Carl Moyer Program could currently provide some funding for optional low NOx-certified engines, changes to the program will be needed for it to provide adequate incentive for purchases of vehicles with such engines.

Table 10 - Estimated Carl Moyer Maximum Funding Amounts for Standard and Optional Low NOx Engines Using Current Carl Moyer Guidelines†

Projects	Original Engine MY	New Engine NOx Level	Maximum Funding Amounts
Vehicle Replacement Projects ($250,000)	1998 - 2001 MY Engine	0.2	$60,000
		0.1	$60,000
		0.05	$60,000
		0.02	$60,000
Vehicle Replacement Projects ($250,000)	2007-2009 MY Engine	0.2	$35,690
		0.1	$38,862
		0.05	$40,448
		0.02	$41,399
New Vehicle Purchase Projects*	2013/14	0.2	N/A
		0.1	$2,728
		0.05	$4,314
		0.02	$5,265

† Generic values were used to calculate these estimated cost numbers; individual projects and similar projects will vary in cost effectiveness and funding amounts.
*Maximum funding is 25 percent of the incremental cost.

Possible changes to the Carl Moyer Program guidelines to further incentivize optional low NOx-certified engines could include the following:

- Increase Carl Moyer Voucher Incentive Program (VIP) funding for optional low NOx certified engines. Currently, VIP allows up to $45,000 for vehicles with 0.2 g/bhp-hr NOx engines. This cap could be raised for optional low NOx-certified engines.
- Expand VIP fleet size to more than 10 for optional low NOx-certified engines, which would allow more fleets to receive funding for such engines.
- Use a weighting factor to increase the calculated benefits when calculating cost effectiveness for projects involving optional low NOx-certified engines. This would recognize the benefit of deploying optional low NOx-certified engines in advancing future low NOx technology (and going beyond just the mass emission benefits achieved by any one project).

The recently adopted Assembly Bill 8 requires ARB in conjunction with local air districts to evaluate Carl Moyer policies and goals (AB-8, 2013). This will provide an opportunity to consider how the Carl Moyer Program could support the deployment of optional low NOx-certified engines to advance future low NOx technology.

In addition to ARB changing the overall Carl Moyer Program guidelines to favor optional low NOx-certified engines, local air districts could choose to

preferentially fund vehicles with such engines using locally available funds. Staff will work with local air districts regarding implementing this idea.

e. Proposition 1B

The Proposition 1B: Goods Movement Emission Reduction Program (Prop 1B) is a $1 billion bond program created by voter-approved Proposition 1B in 2006, and clarified by Senate Bill (SB) 88 (Chapter 181, Statutes of 2007), that provides financial incentives to owners of equipment used in freight movement to upgrade to cleaner technologies. ARB in partnership with local air districts administers the program with the goal of quickly reducing emissions and human health risk due to movement of freight or "goods" along California's four main trade corridors -- Los Angeles/Inland Empire, Central Valley, Bay Area, and San Diego/Border.

Heavy-duty diesel truck projects eligible for Prop 1B funding include the replacement, repower, or retrofit of heavy-duty diesel trucks. New truck purchases are only eligible as part of a replacement project. If ARB adopts optional low NOx emission standards, Prop. 1B funds could potentially be used to help owners purchase trucks certified to the optional, lower levels (ARB, 2013c).

The next update to the Prop 1B guidelines is expected in fall of 2014, with a focus on advanced technologies. Traditional diesel-to-diesel replacement projects are not likely to be included as a project category in future guidelines. However, staff may consider the potential for funding truck replacements and repowers that contain optional low NOx-certified engines if they become available.

f. Truck and Bus Regulation

On December 12, 2008, ARB approved the Truck and Bus regulation to significantly reduce PM and NOx from existing diesel vehicles operating in California. The regulation applies to nearly all diesel-fueled trucks and buses with a GVWR greater than 14,000 pounds that are privately or federally owned. Specific trucks such as other public fleets, solid waste collection trucks, transit buses, and drayage trucks are subject to other regulations.

Starting January 1, 2012, the regulation phases in requirements for fleet owners to reduce PM emissions from heavier trucks by installing exhaust retrofit filters that capture pollutants before they are emitted to the air or by replacing vehicles with newer vehicles that are originally equipped with PM filters. Starting January 1, 2015, the regulation requires accelerated replacements of both lighter and heavier vehicles that do not have PM filters installed. By 2023, under the current Truck and Bus regulation,

nearly all older vehicles will need to be upgraded to have exhaust emissions meeting 2010 MY engine emission levels.

Under the current Truck and Bus regulation, fleet owners that replace vehicles can earn credits to delay compliance for other vehicles in the fleet until 2017. For example, fleets can receive credits if they added more vehicles with 2007 MY or newer engines than normal by January 1, 2012. Also, fleets that purchase fuel efficient hybrid vehicles, alternative fueled vehicles, or vehicles equipped with pilot ignition engines any time prior to 2017 can earn credits to delay compliance for another vehicle in the fleet until 2017. If natural gas engine manufacturers certify engines to the optional low NOx standards, the Truck and Bus regulation's current provision allowing credit for purchase of alternative fueled vehicles could provide an incentive for purchase of such engines.

In the future, the Truck and Bus regulation could be amended to provide additional incentives for optional low NOx certified engines, including diesel fueled engines. This would provide an avenue to distribute low NOx engines into California's truck and bus fleets.

D. Anti-Idling (Amendments)

The proposed amendments to the ATCM to Limit Diesel-Fueled Commercial Motor Vehicle Idling (idling ATCM) would expand responsibility for compliance beyond just the driver, to include the vehicle owner and the motor carrier that dispatched the vehicle. The text of the proposed amended idling ATCM is contained in Appendix I.D.

1. Background

On July 22, 2004, ARB adopted the initial idling ATCM (ARB, 2004) codified in 13 CCR 2485 (CCR, 2013). As adopted in 2004, the idling ATCM applies to diesel-fueled commercial motor vehicles including trucks and buses with a GVWR greater than 10,000 pounds that operate in California. It requires the driver of an applicable vehicle to manually shut off the engine before exceeding five minutes of idling. The idling ATCM also identifies circumstances under which the idling limitations would not apply, including servicing, testing, and inspection of vehicles, idling to perform work for which the vehicle was designed, idling the main engine or operating an auxiliary power system (APS) to prevent a safety or health emergency, idling of military tactical vehicles, workover rigs, and armored cars, and idling of sleeper trucks during resting or sleeping in the sleeper berth.

In October 2005, ARB adopted amendments to the idling ATCM and related amendments to 13 CCR 1956.8 and the incorporated California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles (ARB, 2005; CCR, 2013).

The 2005 amendments addressed both new and in-use vehicles and engines and emission performance of idle reduction technologies installed on sleeper trucks. New 2008 and subsequent MY heavy-duty diesel engines installed on vehicles with a GVWR greater than 14,000 pounds were required to be equipped with a non-programmable engine shutdown system that automatically shuts down the engine after five minutes of continuous idling. In lieu of the engine shutdown system, engine manufacturers may opt to certify the engine to a NOx idling emission standard of 30 grams per hour.

For in-use vehicles, the amendments required operators of both in-state and out-of-state registered sleeper berth-equipped trucks to manually shut down their engines when idling more than five minutes at any location within California, beginning January 1, 2008. Alternative idle reduction technologies such as diesel-fueled APSs and fuel-fired heaters were also required to meet emission performance requirements that ensure emissions are not exceeding the emissions of a truck engine operating at idle. Specifically, the regulation requires diesel-fueled APSs installed on trucks with 2007 and newer engines to control PM emissions by either routing the APS exhaust through the DPF of the truck engine or by retrofitting the diesel APS with a verified level 3 PM control device that reduces PM emissions by at least 85 percent. Fuel-fired heaters installed on trucks with 2007 and newer engines are also required to meet the Ultra-Low Emission Vehicle requirements specified in the Low Emission Vehicle regulations. These requirements became effective beginning in 2008. For trucks equipped with 2006 and older engines, any California or federally certified diesel-fueled APS or fuel-fired heater may be used.

2. Summary of Proposed Amendments

Staff is proposing to amend the idling ATCM, 13 CCR 2485, to extend the applicability of the regulation to include vehicle owners and motor carriers that dispatch affected vehicles to share some of the responsibilities of compliance with the existing requirements of the regulation (CCR, 2013). In addition, staff is proposing to include schools, hotels, and motels in the definition of restricted areas. The proposed amendments would provide ARB better enforcement capabilities, thereby improving the idling ATCM's effectiveness in reducing public exposure to diesel-PM and other contaminants from heavy-duty diesel vehicles and diesel-fueled APSs. Furthermore, the proposed amendments would add definitions of "emission standard" and other terms used in the proposed amendments and make other minor clarifying and corrective changes.

a. Expand Requirements to Include the Owner and Motor Carrier

Currently, the existing regulation applies only to the driver. Thus, when a violation of the idling ATCM occurs, a citation is issued to the driver. However, sometimes citations cannot be issued to the driver because, at the time the vehicle is idling, the driver may not be in the vehicle or may

be resting in the sleeper cab. In such situations, enforcement personnel issue the citation and leave it on the vehicle's window or windshield. A copy of the citation is also sent to the owner of the vehicle, later identified using the license plate of the vehicle or the motor carrier, identified by the motor carrier number displayed on the vehicle, but only for purposes of ultimately reaching the driver. Many such citations have been ignored by the driver, owner, and motor carrier, leaving ARB with no recourse for settling the citation. Such unresolved citations have significantly lowered the compliance rate of the regulation. For example, in 2012, approximately 359 (42 percent) of the 854 citations issued for violations of the idling ATCM remained unsettled as of December 31, 2012 (ARB, 2012b).[13] Under staff's proposal, a copy of the citation would be sent to any one or all of the parties, depending on the information collected at the time of citation. Once the citation is settled by any one of the three responsible parties, the citation would be cleared. This would provide ARB enforcement personnel with the authority to pursue the settlement of open citations with the drivers, owners, and motor carriers associated with the vehicle in violation. Staff is proposing that these requirements become effective beginning January 1, 2015.

b. Add Schools, Hotels, and Motels to the Definition of "Restricted Area"

In addition to expanding the applicability of the idling ATCM to vehicle owners and motor carriers, staff is also proposing to expand the definition of "restricted area," which previously only included individual and multifamily housing units, to include schools, hotels and motels. Restricting idling of both diesel-fueled commercial motor vehicles and APSs to 5 minutes when within 100 feet of schools, hotels and motels would provide additional protection to the public from exposure to diesel PM and other TAC, and reduce potential cancer risk and other adverse health effects associated with diesel emissions. Also, adding schools to the definition of "restricted area" makes the regulation consistent with the requirements in the school bus idling ATCM (CCR, 2013). Staff is proposing that these requirements become effective beginning January 1, 2015.

c. Add Definition of "Emission Standard"

In 2004, the U.S. Supreme Court clarified that the definition of standard as it applies to emissions from motor vehicles and motor vehicle engines under Title II of the federal CAA, relates to the emission characteristics of vehicles or engines and requires motor vehicles or motor vehicle engines to emit no more than a certain amount of a given pollutant, be equipped

[13] Of the citations that remained unsettled at the end of 2012, approximately 87 percent were not signed by the driver, indicating they were left when the driver was not present or was inaccessible. (Nunes, 2013).

with a certain type of pollution-control device, or have some other design feature related to the control of emissions (EMA, 2004).

Staff is proposing that the idling ATCM add a definition of "emission standard" to be consistent with the definition set forth in *EMA* for purposes of clarity, consistency, and conformity. Under the federal definition, requirements to certify engines to the clean idle standard or automatic engine shutdown system relate to a requirement that a vehicle be equipped with a certain type of pollution-control device or a design feature related to the control of emissions, and are emission standards. The proposed amendments are intended to make clear that the definition of emission standard as used in the idling ATCM conforms to the federal definition. The proposed definition, which modifies the definition of "emission standard" as set forth in HSC section 39027, is authorized by HSC sections 39010 and 39601 in that the proposed definition conforms to existing federal definitions.

The definition set forth at section 39027 was enacted by the Legislature in 1975. The new, federally conforming definition effectively recognizes the present state of engine and vehicle design technology and the need to clarify that emission discharges into the atmosphere are more than quantitative emission limits but also include pollution control equipment and other design features of the engine or vehicle that ensure that emission reductions are achieved. For purposes of consistency and clarity, staff is also proposing to add new definitions of the terms "exhaust emission standards" and "evaporative emission standards" to clarify, where needed, previous references to emission standards. These proposed terms are subcategories of emission standards and are used to specifically identify the specified subcategories, as opposed to the broader term of emission standard that encompasses all standards, including the idling ATCM requirements relating to the control of emissions.

d. Other Changes

Staff is also proposing other minor and non-substantive changes to add clarity to the existing regulation. Such modifications include:

i. Adding alternative idle reduction technologies to the "Applicability" section.
ii. Adding applicable HSC references to the "Penalties" section.
iii. Adding "title 13, CCR, section 1956.8" to the subsection "Relationships to Other Laws"
iv. Defining the existing term "Executive Officer" and new terms introduced in the proposed amendment such as "motor carrier," "owner" and "person."
v. Adding a new subsection, "Severability," to indicate that if for any reason a portion of the section becomes invalid by a court, then that

portion is considered a separate provision and such decision does not affect the validity of the remaining portions of the sections.

3. Environmental Impacts Analysis

This section provides an environmental analysis for the proposed amendments. Based on staff's review, staff has determined that implementing the proposed amendments to the idling ATCM described above would not result in any potentially significant adverse impacts on the environment. The analysis below provides the basis for reaching this conclusion. This section of the staff report also discusses environmental benefits expected from implementing the proposed amendments.

a. Prior Environmental Analysis

The environmental analyses performed for the original idling ATCM regulation and its amendments found no significant adverse impacts to the environment and beneficial impacts to air quality and CO2 emissions.

The initial regulation focused on reducing PM and NOx emissions by limiting engine idling of diesel-fueled commercial motor vehicles with a GVWR greater than 10,000 pounds. Drivers of affected vehicles operating in California were required to not idle the vehicle's engine for greater than five minutes at any location unless they met specified exemption criteria. The idling restriction could be achieved by manually shutting off the engine before the five-minute idle time limit expires.

As mentioned above, the initial staff report projected statewide emission reductions from implementing the regulation to be approximately 14 TPD of NOx emissions and 0.5 TPD of PM emissions in 2005 and approximately 51 TPD of NOx emissions and 0.7 TPD of PM emissions in 2009. The staff report also indicated that limiting idling would, as a consequence of reducing targeted diesel exhaust emissions from heavy-duty diesel-fueled vehicles, decrease these vehicles' GHG emissions and thereby reduce the state's contribution to climate change.

The 2005 amendments focused primarily on further reducing NOx emissions from PM filter-equipped diesel-fueled engines and expanded the applicability of the idling ATCM to sleeper-cab trucks. It also established emissions performance requirements for alternative idle reduction technologies such as diesel-fueled APSs and fuel-fired heaters. The 2005 amendments also required 2008 and newer MY heavy-duty diesel engines with a GVWR greater than 14,000 pounds to be equipped with an automatic engine shutdown timer that shuts off the engine after five consecutive minutes of idling or optionally meet a NOx idling emission standard of 30 grams per hour.

The 2005 staff report estimated statewide emission reductions to be approximately 46 TPD of NOx emissions and 0.4 TPD of PM emissions in 2010 and approximately 56 TPD of NOx emissions and 0.1 TPD of PM emissions in 2020.

b. Methods of Compliance

The proposed amendments provide clarity and enhanced enforcement provisions to the current regulation. Implementation of the proposed amendments will require the following actions from the regulated community:

- Requires the vehicle owner, motor carrier that dispatched the vehicle, and the driver to:
  - Not idle or cause to idle the main engine for more than five minutes at any location;
  - Not idle or cause to idle an engine certified to the optional NOx idling standard of 30 grams per hour when within 100 feet of a restricted area;
  - Not operate or cause to operate a diesel-fueled APS for more than five minutes within 100 feet of a restricted area;
  - Not operate or cause to operate a diesel-fueled APS not equipped with a level 3 verified PM control device when installed on a vehicle equipped with an engine certified to the 2007 or newer heavy-duty diesel engine standards;
  - Not operate or cause to operate a fuel-fired heater that is not certified to the fuel-fired heater emission standards established in the Low Emission Vehicle regulations when installed on a vehicle equipped with an engine certified to the 2007 or newer heavy-duty diesel engine standards;
- Requires vehicle operators to not idle more than five minutes within 100 feet of schools, hotels, and motels.

c. Beneficial Impacts

The proposed amendments clarify and expand upon definitional and procedural provisions and enhance enforcement provisions in the existing regulation. The proposed amendments would ensure better compliance by the regulated community and better enforcement capabilities by ARB, thereby improving the idling ATCM's effectiveness in reducing public exposure to diesel PM and other contaminants from heavy-duty diesel vehicles and diesel-fueled APSs.

The existing idling ATCM reduces criteria pollutant emissions by reducing unnecessary idling of diesel-fueled commercial motor vehicles with a GVWR greater than 10,000 pounds. In the 2004 and 2005 rulemakings, statewide emission benefits from the idling ATCM were estimated to be approximately 51 tpd of NOx emissions and 0.7 tpd of PM emissions in

2009 and approximately 56 TPD of NOx and 0.1 TPD of PM emissions in 2020 (ARB, 2004; ARB, 2005). The proposed amendments would not provide additional emission benefits but will ensure that emission benefits from the existing idling ATCM are realized by increasing the regulation's compliance rate. The proposed amendments would also provide those members of the public who attend schools, or work or reside at hotels and motels, additional protection from exposure to diesel particulate matter and other toxic air contaminants, and the associated potential cancer risks and other adverse health effects associated with diesel emissions.

d. Resource Areas with No Impacts

The proposed amendments are administrative in nature in that they consist of minor administrative and procedural changes that would clarify definitions, provide enhanced enforcement by expanding upon the applicability of the rule to not only the vehicle driver, but also the owner and motor carrier, and provide additional information about these responsible parties to facilitate enforcement. These, therefore, and would not result in any activity that could adversely affect the physical environment.

No discussion of alternatives or mitigation measures is necessary because no significant adverse environmental impacts were identified.

4. Economic Impact Assessment/Cost Analysis

The following economic impact assessment/cost analysis has been prepared for this rulemaking action in accordance with the provisions of Government Code section 11346.3b(1)(A)-(D).

The proposed amendments to the idling ATCM would specify that the driver, the owner of the vehicle, and the motor carrier that dispatched the vehicle are liable for any violations of the requirements of the idling ATCM. Compliance with the proposed amendments does not require any new actions to be taken by the driver, owner, or motor carrier since the requirements not to idle the main engine of the vehicle for more than five minutes and/or not to operate non-compliant APSs and fuel-fired heaters have been in effect since February 2005. All the driver has to do is continue to comply with the existing requirements. In addition, owners and motor carriers should have already included idling ATCM information as part of their driver training to comply with the existing regulation. Thus, staff believes that the owner of the vehicle and the motor carrier that dispatched the vehicle will incur no additional cost to comply with the proposed amendments.

Without the proposed amendments, some drivers would continue to violate the existing requirements of the regulation, thereby impacting the health and welfare of California residents and the state's environment. Staff believes that the proposed amendments would significantly reduce noncompliance

with the existing requirements and consequently the expected emission benefits from the existing requirements would be realized. This would also contribute to the state's efforts to meet the emission reduction goals for attaining the National Ambient Air Quality Standards (NAAQS) as required by the federal CAA.

a. Potential Impact on Businesses

Businesses that may be affected by the proposed amendments include owners of commercial diesel-fueled motor vehicles and/or motor carriers that dispatch these vehicles. Based on an analysis of the motor carrier permit registration data obtained from the California Department of Motor Vehicles, there are approximately 265,000 owners and motor carriers affected by the proposed amendments. According to a publication by the American Trucking Association, approximately 90.5 percent of the trucking businesses with 6 or fewer trucks are considered small businesses (ATA 2013). As discussed above, ARB staff has concluded that the proposed regulatory action will have no significant cost impact on directly affected persons or businesses.

b. Potential Impact on Business Competitiveness

No significant impacts to the competitive advantages or disadvantages for businesses currently doing business within the state are anticipated because the amendments would not result in any additional costs to affected regulated entities.

c. Potential Impact on Jobs and Business Creation, Elimination, or Expansion

As discussed previously, the proposed amendments are intended to improve compliance with existing requirements by extending compliance responsibility to include the owner and motor carrier, thereby providing ARB enforcement personnel with greater authority to pursue the settlement of pending citations. The proposed amendments do not impose any new compliance costs on the driver, owner, or motor carrier. As a result, the proposed amendments would not have any impact on the creation or elimination of jobs within the state, or the creation, expansion, or elimination of businesses within California.

d. Potential Costs to Local and State Agencies

The proposed amendments are not anticipated to have any cost impacts to local or state agencies since they would not result in any additional costs to affected regulated entities.

5. Regulatory Alternatives

The alternative considered by staff was to not amend the idling ATCM. This alternative was rejected because it would not resolve the ongoing enforcement issue associated with unsettled citations. Currently, the idling ATCM requires that citations be issued to the driver of a noncompliant

vehicle. Many times, the driver is not present or accessible when the idling vehicle is observed by enforcement personnel. In those cases, the driver's identity is unknown. The citation is left on the vehicle, but many times it goes unsettled with no way to identify the offending driver. As discussed above, in 2012, nearly one-half the idling citations remained unsettled at the end of the year (ARB, 2012b). The proposed amendments to the idling ATCM would make the driver, the owner of the vehicle, and the motor carrier that dispatched the vehicle directly responsible for compliance. This would provide ARB enforcement personnel with greater authority to pursue the settlement of pending citations with the owners and motor carriers associated with the vehicle in violation. ARB believes this will greatly reduce the number of unsettled citations.

Furthermore, the idling ATCM currently prohibits main engine idling or operation of a diesel-fueled APS within 100 feet of a restricted area which the existing ATCM defines as "any real property zoned for individual or multifamily housing units that has one or more of such units on it", which would also include schools, hotels and motels. However, the existing idling ATCM does not explicitly include schools, hotels and motels in the definition of "restricted area". Although the school bus idling ATCM (13 CCR 2480) has a provision that prohibits idling of diesel-fueled commercial motor vehicles within 100 feet of a school, a no-action alternative would not prohibit drivers from idling near schools, hotels and motels thus exposing the public who attend schools, or work or reside at hotels and motels to harmful emissions. Modifying the definition of "restricted area" to include schools, hotels, and motels would clarify the provisions of the idling ATCM and also would make it consistent with the provisions in the school bus idling ATCM. In addition, the proposed amendments would serve to ensure that the emission benefits of the existing ATCM are realized.

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 the affected private persons than the proposed idling ATCM amendments.

E. Heavy-Duty Hybrid-Electric Vehicles Certification Procedures (Amendments)

Staff is proposing amendments to the California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles in the Urban Bus and Heavy-Duty Vehicle Classes. The text of the proposed amended procedures, which would remain voluntary, interim procedures, is contained in Appendix I.E.1

1. Background

In 2002, ARB adopted California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles in the Urban Bus and Heavy-

Duty Vehicle Classes (Interim Procedure) (ARB, 2002). This Interim Procedure was adopted in conjunction with modifications to the Public Transit Bus Fleet Rule, as seen in 13 CCR 2023-2023.4, to reflect advances in technology that could not be captured in ARB's existing heavy-duty certification procedures (CCR, 2013). The Board approved these Interim Procedures with the intention of revisiting the procedures if needed in future years.

Due to expanding commercialization and advancement of hybrid technology into more sectors of the heavy-duty market, and the need to better quantify emission reductions from existing and future heavy-duty hybrid vehicles, staff believes that updates to the existing Interim Procedures are warranted.

Before manufacturers can legally sell or offer for sale new engines or new motor vehicles in California, manufacturers must certify those engines or vehicles with ARB in accordance with ARB developed test procedures. The proposed amendments to the Interim Procedures are designed for heavy-duty hybrid-electric vehicle manufacturers seeking voluntary vehicle-based (as opposed to engine-based) certification. The proposed amendments to the interim procedure are based on a modified version of the Society of Automotive Engineers (SAE) J2711 Recommended Practice (SAE, 2012). The interim procedure was developed to test the emissions of heavy-duty hybrid-electric vehicles using a chassis dynamometer.

Conventional heavy-duty engines are certified on an engine dynamometer. Heavy-duty hybrid vehicles are typically manufactured by coupling a conventional engine with a hybrid-drive system.[14] For most heavy-duty hybrid vehicles, the manufacturers of the conventional engine and the hybrid drive system are generally separate entities; one exception is a recently certified vertically-integrated heavy-duty hybrid vehicle where both the engine and the hybrid-drive system were designed and manufactured as an integrated unit by a manufacturer.

The proposed amendments to the Interim Procedures require that the conventional engine that is used in the hybrid vehicle must be a certified engine. Under the proposed amendments, the complete hybrid vehicle must be tested on a chassis dynamometer. The ARB certification value for a heavy-duty hybrid-electric vehicle is determined through calculations using chassis dynamometer test results and engine certification values for both the hybrid-electric vehicle and a comparable conventional vehicle. Once certification is obtained, an Executive Order is issued to the entity that applied

[14] After a one year delay in implementation, 2014 MY HDDEs intended for use in heavy-duty hybrid vehicles need to show compliance with OBD requirements. As such, HDDE certification includes hybrid systems now.

for certification and is responsible for complying with emissions and other requirements.

A number of financial incentive programs require that heavy-duty hybrid vehicles be certified or be able to demonstrate emissions and/or fuel economy benefits over comparable conventional vehicles as one condition to be eligible for receiving grants. The proposed amendments were designed to allow a manufacturer to certify its heavy-duty hybrid vehicles, in order for the vehicle to be eligible for grants. The Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP), for example, offers fleets extra incentive money to purchase vehicles that have obtained ARB vehicle certification (ARB, 2012c).

2. Description of Proposed Amendments

Staff is proposing amendments to the existing Interim Procedures focused on the chassis dynamometer testing portion of the overall certification process. The goal of the proposed amendments is to ensure that the revised test procedures are applicable to a wider range of vehicle classes and vocations. It is ARB's intention to revisit the approved certification procedures in the future if needed.

The proposed amendments are designed to reflect the state of technology and provide appropriate emission test procedures for heavy-duty hybrid technologies. Since the Board's adoption of the Interim Procedure in 2002, advances in hybrid technology have led to its application in more diverse vocational applications, other than just urban buses, such as beverage, package, and linen delivery vehicles. The proposed amendments are needed to ensure that the Interim Procedures adequately measure emissions from these different vocational hybrid vehicles and to account for new heavy-duty hybrid-electric technologies such as plug-in hybrid-electric vehicles. The variety of vocational hybrid vehicles as well as the development of different types of hybrid technologies has also prompted SAE to amend its recommended practice (J2711), which is referenced in the amended Interim Procedure, for testing heavy-duty hybrid vehicles.

Other proposed changes are intended to clarify and enhance specific program requirements. Some key amendments are as follows:

- The applicability was amended to apply to a wider range of heavy-duty vehicles including hydraulic, turbine, flywheel, or fuel cell hybrid vehicles.
- A number of new definitions were added based on SAE J2711 such as the average loaded vehicle weight, charge depleting mode, and curb weight.
- Some existing definitions such as that for "baseline urban transit bus," were amended.

- Reference documents, such as SAE J2711, were reviewed and updated.
- Existing requirements on testing facilities, equipment, and procedures were updated to provide detailed information on the test instruments, charge-depleting and charge-sustaining evaluation procedures, etc.
- Clarification was added that the calculation of emission factors is based on the larger value of the two emission results.

It is staff's intent that the amended test procedures will remain voluntary, interim procedures. Future revisions to the procedures may be incorporated into the Phase 2 GHG standards, on which staff is working jointly with U.S. EPA.

3. Environmental Impacts Analysis

This section provides an environmental analysis for the proposed amendments. Staff concludes the proposed amendments to the California Interim Certification Procedures described above would not result in any significant adverse impacts on the environment. The analysis below provides the basis for reaching this conclusion. This section of the staff report also discusses environmental benefits expected from implementing the proposed amendments.

a. Prior Environmental Analysis

In October 2002, ARB adopted California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes (Interim Procedure). This Interim Procedure was adopted in conjunction with modifications to the Public Transit Bus Fleet Rule and Emission Standards for New Urban Buses, originally adopted in February 2000, to reflect advances in technology that could not be captured in ARB's existing heavy-duty certification procedures. The staff reports for the Interim Procedure did not identify any adverse environmental impacts.

b. Methods of Compliance

The proposed amendments are intended to assist applicants in their certification process and to address compliance issues by ensuring that each applicant's certified vehicle will stay in compliance over the vehicle's specified useful life. As with the current Interim Procedure, the proposed amendments would continue to be voluntary. Truck assemblers or manufacturers would not be required to do anything beyond current engine certification. Test facilities, however, would be required to follow the new testing procedures and certification requirements, as amended. While voluntary, implementation of the proposed amendments would

entail the following administrative and procedural actions from the regulated community:

- Test procedures would be applicable to new heavy-duty, greater than 14,000 pounds GVWR hybrid-electric vehicles, including hybrid-electric urban buses, and other hybrid vehicles such as plug-in, hydraulic, turbine, flywheel, and fuel cell vehicles.
- Test facilities would amend calculations of exhaust emissions by calculating the weighted mass emission level for each drive cycle.
- Test facilities would follow the new testing procedure as amended in reference to SAE J2711.
- Heavy-duty vehicle manufacturers may test and certify heavy-duty vehicles, but must certify engines prior to selling in California.

c. Beneficial Impacts

The proposed amendments expand on the scope of the interim certification procedures. In the long term, the expanded certification procedures could enable more hybrid-electric vehicles to be certified and produced, which could provide air quality emission benefits.

d. Resource Areas with No Impacts

The proposed amendments to the regulation consist of minor administrative and procedural changes to definitions, test procedures, and the certification process currently used to certify heavy-duty hybrid vehicles. These amendments do not change the stringency or effectiveness of the current certification process. The proposed amendments would not result in any significant or potentially significant adverse impacts on the environment because compliance with the proposed regulation would not cause any activity, either directly or indirectly that could affect the physical environment.

No discussion of alternatives or mitigation measures is necessary because no significant adverse environmental impacts were identified.

4. Economic Impact Assessment/Cost Analysis

The following economic impact assessment/cost analysis has been prepared for this rulemaking action in accordance with the provisions of Government Code section 11346.3b(1)(A)-(D).

In February 2000, ARB adopted the Public Transit Bus Fleet Rule, a new regulation establishing a public transit bus fleet rule and emission standards for new urban buses (ARB, 2000). In October 2002, the Public Transit Bus Fleet Rule was modified in conjunction with the adopted Interim Procedure - California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles in the Urban Bus and Heavy-Duty Vehicle Classes.

Staff estimates that the cost due to the implementation of the proposed amendments would have no impact on the costs already estimated in the existing Interim Procedures. The amendments are mostly updates and clarifications that would not affect the certification costs of hybrid-electric vehicles. However, in the long term, the proposed amendments may potentially provide more emissions benefits if more heavy-duty hybrid vehicles are certified than through the existing interim procedures. Additionally, the proposed amendments may potentially provide more cost benefits because of the increased production of hybrid vehicles, which could result in lower hybrid vehicle costs due to economies of scale. Thus, the proposed amendments would enable California to continue to meet the state's criteria pollutant standards, help reduce public exposure to toxic exhaust emissions, and reduce GHG emissions.

The proposed amendments are voluntary but could impact up to approximately 40 businesses. The affected businesses are manufacturers of heavy-duty hybrid-electric buses and vehicles, hybrid-electric drive system manufacturers, engine manufacturers, transmission manufacturers, battery manufacturers, and manufacturers of components/parts that sell their products in California. These manufacturers are mostly large businesses and are mostly located outside California. There are approximately 19 businesses that manufacture diesel or gasoline California-certified heavy-duty engines and approximately 11 businesses that manufacture natural gas California-certified heavy-duty engines (ARB, 2013d). Approximately four heavy-duty hybrid drive system manufacturers have had their hybrid drive systems certified for California's market.

The incremental increase in retail price of a new hybrid-electric vehicle is estimated to range from $40,000 to $80,000 compared to the new conventional heavy-duty vehicles (ARB, 2012c). Staff expects that even with a relatively modest increase in the production volumes of heavy-duty hybrid vehicles, the retail price may be reduced from the current level (Hybrid Truck Users Forum, 2009). If this occurs, the purchase of hybrid vehicles could become more economical from a life-cycle cost perspective; possibly to the point that consumers could be purchasing hybrid vehicles on the basis of fuel savings, without additional state financial incentives (such as HVIP) or federal (Diesel Emission Reduction Act (DERA)) financial incentives.

a. Costs to Certify Hybrid-Electric Vehicles

The proposed amendments to the existing Interim Procedures are largely to update and improve clarity, and should not result in any increased costs for hybrid-electric vehicle manufacturers over those costs identified in the existing Interim Procedures.

b. Creation or Elimination of Jobs within the State

Minimal impacts to the creation of jobs within California are anticipated because of the small number of businesses that could be affected by the proposed amendments. The proposed amendments could create an additional market for manufacturers of hybrid-electric vehicles, if they want to take advantage of the opportunity to certify heavy-duty hybrid vehicles for sale in California. Additional jobs could be created at laboratory or testing facilities if manufacturers decide to certify their hybrid-electric vehicles using facilities located in California. However, since the amended Interim Procedures are voluntary, the job creation may or may not occur. Most likely, there would be no elimination of existing jobs within the state.

c. Creation of New Businesses or the Elimination of Existing Businesses within the State

Minimal impacts to the creation of new businesses within the state are anticipated because the proposed amendments would still be voluntary. A few businesses such as manufacturers of hybrid-electric vehicles and components or parts, laboratories or testing facilities may be created or expanded if the demand for vehicle purchases and chassis testing increases. Most likely, there would be no elimination of existing businesses within the state.

d. Competitive Advantages or Disadvantages for Businesses Currently Doing Business within the State

No significant impacts to the competitive advantages or disadvantages for businesses currently doing business within the state are anticipated because the proposed amendments to the existing Interim Procedures are relatively minor and voluntary. As a result, staff believes that the proposed amendments would not cause noticeable adverse impacts on California employment, business status, and competitiveness.

e. Testing Costs

Truck assemblers or manufacturers voluntarily choosing to certify their hybrid-electric vehicles would not be required to do anything beyond current interim certification procedures. Therefore, there are no additional costs relative to the existing interim certification procedures because the required number of drive cycles, cycle length, repetitions of cycles, test equipment, and analyzers remain the same.

f. Financial Opportunities

Although there is no additional cost relative to the interim certification procedures, the retail price of a hybrid-electric vehicle is still higher compared to a conventional vehicle due to the increase in component costs as well as the increase in design and manufacturing costs. The current purchase cost for hybrid-electric vehicles may already be higher

for consumers; however, consumers incur these costs voluntarily because there are no purchasing requirements for hybrid-electric vehicles. Also, consumers do not typically have to pay for the total incremental cost of purchasing a new hybrid-electric vehicle because of existing incentive programs. For example, HVIP provides funding to offset about one-half of the incremental cost of an eligible hybrid-electric vehicle using a voucher. The remaining incremental costs may be covered by other funding sources such as federal funds, local incentive programs, and other applicable funding. The increased cost of purchasing a hybrid-electric vehicle due to the hybrid drive system components and/or testing costs are not considered an economic impact because the costs attributable to those factors were already estimated in the existing interim certification procedures.

5. Regulatory Alternatives

Staff considered the following regulatory alternatives to the proposed amendments. 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 the affected private persons than the proposed amendments.

a. Do not amend current procedure

The existing Interim Procedure for heavy-duty hybrid vehicles was originally adopted to serve the needs of the Public Transit Urban Bus Fleet Rule, which was adopted in 2002, where the availability of certified heavy-duty hybrid urban buses would play an important role for transit agencies to comply with the required fleet average emission standards. Thus, although the Interim Procedure could be used to certify other heavy-duty hybrid vehicles, it was tailored for use in the urban bus application. The advancements of hybrid technologies have resulted in the commercialization of more types of hybrid systems for heavy-duty vehicles as well as more vocational applications. In addition, industry's testing procedures for heavy-duty hybrid vehicles have also advanced, resulting in more accurate assessments of the performance and efficiency of hybrid systems. Because of these reasons, it would become increasingly more difficult to use the existing Interim Procedures, if not amended, to certify the expanding vocational applications of different types of heavy-duty hybrid technologies.

Although no additional costs would result if the existing Interim Procedure was not amended, an increasing number of vocational heavy-duty hybrid vehicles may not be able to be certified appropriately, and emissions benefits not properly quantified. Because of these reasons, this alternative was rejected since the needs of the fleets for certified heavy-duty hybrid vehicles in vocation-specific applications would not be met. The targeted emission reductions and goals outlined from both a federal

and state perspective could not be accurately measured with any confidence with outdated testing procedures that do not apply to these categories of vehicles.

b. Adopt more stringent test procedures and require mandatory certification

Consideration of more stringent standards or procedures could potentially make it too difficult or costly for heavy-duty hybrid vehicle manufacturers to be able to certify their products, resulting in fewer certified hybrid vehicles, thereby resulting in lost opportunities for potential additional emission reductions. Additionally, if ARB requires the proposed amendments to the interim test procedures to be mandatory, this could cause many manufacturers to leave California's heavy-duty hybrid vehicle market due to its relatively small market share (relative to the sales of conventional vehicles) in relation to certification costs. Although the heavy-duty hybrid technology market has evolved significantly since the interim certification procedures were originally adopted in 2002, this market is still very fragmented and relatively immature compared to the technology and market of conventional combustion heavy-duty engines. The possible absence of heavy-duty hybrid vehicles in California, including the likely reduction in product availability if the requirements for certification are too onerous (e.g., more drive cycles and test data requirements) would have a negative impact on California's efforts to attain air quality standards as well as potentially detrimental effects on the advancement of heavy-duty hybrid-electric technology. Because of the expected higher costs associated with more stringent requirements and because of other possible negative impacts as discussed, this alternative was rejected.

V. Summary of Economic Impacts

Due to the voluntary nature of the proposed regulations and regulatory amendments in addition to what is already required due to federal rules and regulations, the proposed regulations and regulatory amendments will impose minimal or no associated costs to affected parties as well as minimal or no economic impacts on businesses, as explained below.

Complying with the federal Phase 1 GHG standards will impose costs on engine and vehicle manufacturers; however, California's harmonization with the federal Phase 1 GHG standards, as proposed in this staff report, will add only minimal costs for manufacturers to provide a copy of submitted materials to California. Staff expects this to cost no more than $1,000 per manufacturer, with no impact on new vehicle prices. Overall, compliance with the federal Phase 1 program and proposed Phase 1 regulations will result in overall cost savings to fleets, due to the associated reductions in fuel use and therefore fuel costs.

The proposed amendments to the Tractor-Trailer GHG regulation consist of relaxing or removing existing requirements rather than creating additional requirements. Therefore, they impose no additional costs.

Because the proposed new, optional low NOx standards are voluntary, their associated costs depend on the level of participation by engine manufacturers, i.e., whether each engine manufacturer decides to include an optional low NOx engine in their product line-up. Costs for participating manufacturers are expected to range from $10,000 to $30,000 per engine family for engine families that do not need redesign up to more than $500,000 when redesign is required. For manufacturers that do not choose to comply with the optional standards, there are no additional costs. Based on two scenarios with low and high manufacturer participation rates, staff estimates total costs of $36 to 279 million over 20 years and a cost-effectiveness of $2 to 7 per pound of NOx reduced.

The proposed amendments to the idling ATCM will not impose any new requirements on affected parties, beyond those requirements that have already been in effect since February 2005. Therefore, staff believes that the proposed amendments to the idling ATCM will impose minimal or no additional compliance costs.

The proposed amendments to the Heavy-Duty Hybrid-Electric Vehicles Certification Procedures will impose minimal or no additional compliance costs because they are voluntary and consistent with the existing interim certification procedures, and implementing the amendments will have no impact on the costs already associated with certifying hybrid-electric vehicles in California. Instead, the proposed amendments may in the long term provide cost benefits if more heavy-duty hybrid vehicles are certified using the amended procedures.

VI. Summary of Environmental Impacts Analysis

The proposed regulations and regulatory amendments included in Appendix I are designed to reduce GHG and criteria emissions from medium-duty and heavy-duty vehicles and engines and ensure compliance with existing regulations. Staff has summarized the air quality emissions reduction benefits below:

- The proposed Phase 1 regulations do not contain any additional compliance requirements besides what are already being required by the federal Phase 1 GHG rule. Therefore it would not result in any additional direct emissions benefits. Staff quantified the emissions benefits of the federal Phase 1 program in California and calculated CO2 reductions of 3.1 MMTCO2e in 2020 and 7.0 MMTCO2e in 2035. This corresponds to a 7.2 percent reduction in 2020 and 12.5 percent reduction in 2035.

- The amendments to sunset the requirements for 2014 and subsequent MY tractors, when considered in isolation, could potentially result in a decrease in

emissions reductions from the Tractor-Trailer GHG regulation by 0.2 MMTCO2e statewide in the year 2020. However, when the amendments are considered in conjunction with the proposed adoption of the California Phase 1 GHG regulations, this reduction in emission benefits is offset by the requirement for 2014 and subsequent model tractors to meet the more stringent federal Phase 1 program which staff estimates will result in an emission reduction benefit of 3.1 MMTCO2e statewide in the year 2020.

- The emissions benefits associated with the Optional Low NOx emission standard regulation depend on the level of participation by engine manufacturers since the proposed regulation is optional. Staff estimated NOx emission benefits for two different scenarios based on low and high participation rates from manufacturers and calculated a NOx emission reduction benefit of 0.6 to 1.2 TPD statewide in 2020, and 3.3 to 6.9 TPD in 2035.

- In the 2004 and 2005 rulemakings for the idling ATCM, staff estimated emissions reduction benefits of 51 TPD of NOx and 0.7 TPD of PM in 2009 and 56 TPD of NOx and 0.1 TPD of PM in 2020. The proposed amendments to the idling ATCM would not result in any additional emissions benefits, but would ensure that the emissions benefits from the existing regulation are more fully realized by increasing the compliance rate.

- The proposed amendments to the Heavy-Duty Hybrid- Electric Vehicles Certification Procedures would provide a more comprehensive certification process. If more heavy-duty hybrid vehicle manufacturers voluntarily use these procedures and more heavy-duty hybrid vehicles are certified and produced, this could provide potential emissions benefits.

The five regulatory proposals would not result in any significant adverse impacts on the environment since they would not lead to any activity that may result in an adverse physical change to the existing environment. The proposed regulations and amendments would not require any actions that involve or adversely affect the following environmental resource areas: aesthetics, air quality, agricultural and forestry resources, biological resources, cultural resources, geology and soils, greenhouse gases, hazardous material, hydrology and water quality, land use planning, mineral resources, noise, population and housing, public services, recreation, traffic and transportation, and utilities.

VII. Summary of Environmental Justice Impacts

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 (California Government Code Section 65040.12(c)). ARB has committed to making environmental justice an integral part of its activities and policies.

Over the past thirty years, ARB, local air districts, and federal air pollution control programs have made substantial progress towards improving air quality in California. This progress has reduced the exposure of California's residents to air pollution.

The emissions reductions resulting from the adoption of the proposed regulations and amendments, described in detail above, will help reduce public exposure to toxic exhaust emissions from the heavy-duty vehicles that operate throughout the State. The reductions should be particularly helpful in environmental justice communities, which, due to their proximity to roadways and industrial facilities, often experience relatively high volumes of heavy-duty truck traffic (U.S. EPA, 2003).

VIII. List of Acronyms and Abbreviations

AB	Assembly Bill
a/c	Air conditioning
ABT	Averaging, banking and trading
APS	Auxiliary power system
ARB	Air Resources Board
ATCM	Airborne Toxic Control Measure
BACT	Best Available Control Technology
Board	Air Resources Board
CA	California
CAA	Clean Air Act
CCR	California Code of Regulations
CD	Coefficient of drag
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CH4	Methane
CLD	Chemiluminescence detector
CNG	Compressed natural gas
CO	Carbon monoxide
CO2	Carbon dioxide
CRR	Coefficient of rolling resistance
DERA	Diesel Emission Reduction Act
DOC	Diesel oxidation catalyst
DPF	Diesel particulate filter
ECM	Engine control module
EGR	Exhaust gas recirculation
EMA	*Engine Manufacturers Association v. South Coast Air Quality Management District*
EMFAC	Emission Factors (model)
EPA	Environmental Protection Agency
FCL	Family certification limit
FEL	Family emission limit
FR	Federal Register
FTP	Federal test procedure
g/bhp-hr	Grams per brake horsepower –hour
g/mile	Grams emitted per mile travelled
g/ton-mile	Grams emitted from carrying a ton of cargo over a distance of one mile
GEM	Greenhouse gas emissions model
GHG	Greenhouse gas(es)
GVWR	Gross vehicle weight rating
GWP	Global warming potential
HC	Hydrocarbon
HCCI	Homogeneous charge compression ignition

HD	Heavy-duty
HDDE	Heavy-duty diesel engine
HDV	Heavy-duty vehicle
HFC	Hydrofluorocarbons
HHD	Heavy heavy-duty
HSC	Health and Safety Code
HVIP	Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project
ISOR	Initial Statement of Reasons
LHD	Light heavy-duty
LNT	Lean NOx trap
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
LRR	Low rolling resistance
MHD	Medium heavy-duty
MMT	Million metric tons (separate from MMTCO2e)
MMTCO2e	Million metric tons carbon dioxide equivalent
MY	Model year
NAAQS	National Ambient Air Quality Standard
NHTSA	National Highway Traffic Safety Administration
NMHC	Non-methane hydrocarbon
N20	Nitrous oxide
NOx	Oxides of nitrogen
OBD	On-board diagnostics
Phase 1	Greenhouse Gas Emission Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles
PM	Particulate matter
PM2.5	Particles up to 2.5 microns in diameter
ppm	Parts per million
PUV	Pickup trucks and vans
RIA	Regulatory Impact Analysis
SAE	Society of Automotive Engineers
SB	Senate Bill
SCAQMD	South Coast Air Quality Management District
SCGC	Southern California Gas Company
SCR	Selective catalytic reduction
SET	Supplemental emission test
SIP	State Implementation Plan
TAC	Toxic air contaminants
TPD	Tons per day
TT	Tractor-trailer
TWC	Three-way catalyst
ULSD	Ultra-low sulfur diesel
U.S. EPA	United States Environmental Protection Agency
VDECS	Verified diesel emission control strategy
VGT	Variable geometry turbocharger
VIP	Carl Moyer Voucher Incentive Program

VMT	Vehicular miles traveled
VV	Vocational vehicle
WF	Work factor

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Appendix I – Proposed Regulation Orders

APPENDIX I-A

PROPOSED REGULATION ORDER FOR PHASE I GREENHOUSE GAS REGULATIONS

Note: Set forth below are the proposed amendments to title 13, California Code of Regulations (CCR), sections 1900, 1956.8, 2036, 2037, 2112, 2139, 2140, and 2147 and the proposed adoption of subarticle 12, title 17, CCR, sections 95660, 95661, 95662, 95663, and95664. Proposed amendments to existing sections are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions. Subsections for which no changes are proposed in this rulemaking are indicated with [No change] or "* * * *". Sections 95660 95661, 95662, 95663 and 95664 are new sections, shown without underline for easier reading.

1. Amend section 1900, title 13, CCR, to read as follows:

§ 1900 Definitions.

(a) [no change]

(b) In addition to the definitions incorporated under subdivision (a), the following definitions shall govern the provisions of this chapter;

* * * *

(3) "Emission standard" as it applies to compliance with the requirements applicable to motor vehicles and motor vehicle engines set forth in Article 2, Chapter 1, Division 3 of Title 13, California Code of Regulations, and the associated remedies provided in the Health and Safety Code for noncompliance, means:

(a) a numerical limit on the amount of a given pollutant that a motor vehicle or motor vehicle engine may emit into the atmosphere; or

(b) a requirement that a motor vehicle or motor vehicle engine be equipped with a certain type of pollution-control device or some other design feature related to the control of emissions.

(4) "Evaporative emission standards" are a subset of emission standards that refer to the specific motor vehicle fuel evaporative emission standards and test procedures incorporated by reference in title 13, CCR section 1976 to which a vehicle is certified.

(5) "Exhaust emission standards" or "tailpipe emission standards" are a subset of emission standards that collectively refer to the specific standards to which a motor vehicle or motor vehicle engine is certified.

(~~36~~) "Emissions-related part" means any automotive part, which affects any regulated emissions from a motor vehicles which is subject to California or federal emissions standards. This includes, at a minimum, those parts specified in the "Emissions-Related Parts List," adopted by the State Board on November 4, 1977, as last amended May 19, 1981.

(~~47~~) "Gaseous fuels" means any liquefied petroleum gas, liquefied natural gas, or compressed natural gas fuels for use in motor vehicles.

(~~58~~) "Heavy-duty engine" means an engine which is used to propel a heavy-duty vehicle.

(~~69~~) "Heavy-duty vehicle" means any motor vehicle having a manufacturer's gross vehicle weight rating greater than 6,000 pounds, except passenger cars.

(~~710~~) "Identical device" means a crankcase emission control device identical in all respects, including design, materials, manufacture, installation and operation, with a device which has been certified by the Air Resources Board or the Motor Vehicle Pollution Control Board pursuant to the Health and Safety Code, but which is manufactured by a person other than original manufacturer of the device.

(~~811~~) "Independent low volume manufacturer" means a manufacturer with California annual sales of less than 10,000 new passenger cars, light-duty trucks and medium-duty vehicles following aggregation of sales pursuant to this section 1900(b)(8). Annual sales shall be determined as the average number of sales sold for the three previous consecutive model years for which a manufacturer seeks certification; however, for a manufacturer certifying for the first time in California, annual sales shall be based on projected California sales for the model year. A manufacturer's California sales shall consist of all vehicles or engines produced by the manufacturer and delivered for sale in California, except that vehicles or engines produced by the manufacturer and marketed in California by another manufacturer under the other manufacturer's nameplate shall be treated as California sales of the marketing manufacturer. The annual sales from different firms shall be aggregated in the following situations: (1) vehicles produced by two or more firms, one of which is 10% or greater part owned by another, except in circumstances for which the Executive Officer determines that 10% or greater ownership by one of the firms does not result in responsibility for overall direction of both firms; or (2) vehicles produced by any two or more firms if a third party has equity ownership of 10% or more in each of the firms; or (3) vehicles produced by two or more firms having a common corporate officer(s) who is (are) responsible for the overall direction of the companies; or (4) vehicles imported or distributed by all firms where the vehicles are manufactured by the same entity and the importer or distributor is an authorized agent of the entity.

(~~912~~) "Intermediate volume manufacturer" means any pre-2001 model year manufacturer with California sales between 3,001 and 60,000 new light- and medium-duty vehicles per model year based on the average number of vehicles sold by the

manufacturer each model year from 1989 to 1993; any 2001 through 2002 model year manufacturer with California sales between 4,501 and 60,000 new light- and medium-duty vehicles per model year based on the average number of vehicles sold by the manufacturer each model year from 1989 to 1993; any 2003 through 2017 model year manufacturer with California sales between 4,501 and 60,000 new light- and medium-duty vehicles based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification; and any 2018 and subsequent model year manufacturer with California sales between 4,501 and 20,000 new light- and medium-duty vehicles based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification. For a manufacturer certifying for the first time in California, model year sales shall be based on projected California sales. A manufacturer's California sales shall consist of all vehicles or engines produced by the manufacturer and delivered for sale in California, except that vehicles or engines produced by the manufacturer and marketed in California by another manufacturer under the other manufacturer's nameplate shall be treated as California sales of the marketing manufacturer.

* * * *

(~~10~~13) "Large volume manufacturer" means any 2000 and subsequent model year manufacturer that is not a small volume manufacturer, or an independent low volume manufacturer, or an intermediate volume manufacturer.

(~~11~~14) "Light-duty truck" means any 2000 and subsequent model motor vehicle certified to the standards in section 1961(a)(1) rated at 8,500 pounds gross vehicle weight or less, and any other motor vehicle, rated at 6,000 pounds gross vehicle weight or less, which is designed primarily for purposes of transportation of property or is a derivative of such a vehicle, or is available with special features enabling off-street or off-highway operation and use.

(~~12~~15) "Medium-duty passenger vehicle" means any medium-duty vehicle with a gross vehicle weight rating of less than 10,000 pounds that is designed primarily for the transportation of persons. The medium-duty passenger vehicle definition does not include any vehicle which: (1) is an "incomplete truck" i.e., is a truck that does not have the primary load carrying device or container attached; or (2) has a seating capacity of more than 12 persons; or (3) is designed for more than 9 persons in seating rearward of the driver's seat; or (4) is equipped with an open cargo area of 72.0 inches in interior length or more. A covered box not readily accessible from the passenger compartment will be considered an open cargo area, for purposes of this definition.

(~~13~~16) "Medium-duty vehicle" means any pre-1995 model year heavy-duty vehicle having a manufacturer's gross vehicle weight rating of 8,500 pounds or less; any 1992 through 2006 model-year heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission vehicle certified to the standards in section 1960.1(h)(2) having a manufacturer's gross vehicle weight rating of 14,000 pounds or less; any 1995 through 2003 model year heavy-duty vehicle certified to the standards in section 1960.1(h)(1) having a manufacturer's gross vehicle weight rating of 14,000

pounds or less; and any 2000 and subsequent model heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission vehicle certified to the standards in Section 1961(a)(1), 1962, or 1962.1 having a manufacturer's gross vehicle weight rating between 8,501 and 14,000 pounds.

(~~14~~17) "Modified part" means any aftermarket part intended to replace an original equipment emission-related part and which is not functionally identical to the original equipment part in all respects which in any way affect emissions, excluding a consolidated part.

(~~15~~18) "Motorcycle Engine" means an engine which is used to propel a new, street-use motorcycle.

(~~16~~19) [Reserved]

(~~17~~20) "Passenger car" means any motor vehicle designed primarily for transportation of persons and having a design capacity of twelve persons or less.

(~~18~~21) "Reactivity adjustment factor" means a fraction applied to the NMOG emissions from a vehicle powered by a fuel other than conventional gasoline for the purpose of determining a gasoline-equivalent NMOG level. The reactivity adjustment factor is defined as the ozone-forming potential of clean fuel vehicle exhaust divided by the ozone-forming potential of gasoline vehicle exhaust.

(~~19~~22) "Recall" means:

(A) The issuing of notices directly to consumers that vehicles in their possession or control should be corrected, and/or

(B) Efforts to actively locate and correct vehicles in the possession or control of consumers.

(~~20~~23) "Replacement part" means any aftermarket part intended to replace an original equipment emissions-related part and which is functionally identical to the original equipment part in all respects which in any way affect emissions (including durability), or a consolidated part.

(~~21~~24) "Subgroup" means a set of vehicles within an engine family distinguishable by characteristics contained in the manufacturer's application for certification.

(~~22~~25) "Small volume manufacturer" means, with respect to the 2001 and subsequent model-years, a manufacturer with California sales less than 4,500 new passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles and heavy-duty engines based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification as a

small volume manufacturer; however, for manufacturers certifying for the first time in California model-year sales shall be based on projected California sales. A manufacturer's California sales shall consist of all vehicles or engines produced by the manufacturer and delivered for sale in California, except that vehicles or engines produced by the manufacturer and marketed in California by another manufacturer under the other manufacturer's nameplate shall be treated as California sales of the marketing manufacturer. Except as provided in the next paragraph, for the 2009 through 2017 model years, the annual sales from different firms shall be aggregated in the following situations: (1) vehicles produced by two or more firms, one of which is 10% or greater part owned by another; or (2) vehicles produced by any two or more firms if a third party has equity ownership of 10% or more in each of the firms; or (3) vehicles produced by two or more firms having a common corporate officer(s) who is (are) responsible for the overall direction of the companies; or (4) vehicles imported or distributed by any firms where the vehicles are manufactured by the same entity and the importer or distributor is an authorized agent of the entity. Notwithstanding the provisions of this paragraph, upon application to the Executive Officer, a manufacturer may be classified as a "small volume manufacturer" for the 2013 through 2017 model years if the Executive Officer determines that it is operationally independent of the firm that owns 10% or more of the applicant or has a greater than 10% equity ownership in the applicant based on the criteria provided in the last paragraph of this subsection (b)(22).

* * * *

NOTE: Authority cited: Sections 39010, 39600, 39601, 43013, 43018, 43101, and 43104, Health and Safety Code; Reference: Sections 39002, 39003, 39010, 39500, 40000, 43000, 43013, 43018.5, 43100, 43101, 43101.5, 43102, 43103, 43104, 43106, and 43204, Health and Safety Code; and Section 27156, Vehicle Code.

2.) Amend section 1956.8, title 13, CCR, to read as follows:

§ 1956.8. Exhaust Emission Standards and Test Procedures - 1985 and Subsequent Model Heavy-Duty Engines and Vehicles.

(a)(1) *[Exhaust emission standards for new 1985 through 2003 model heavy-duty diesel engines, heavy-duty natural-gas-fueled and liquefied-petroleum-gas-fueled engines derived from diesel-cycle engines and for new 1993 through 2003 model heavy-duty methanol-fueled diesel engines – No change]*

(a)(2) *[Exhaust emission standards for new 2004 and subsequent model heavy-duty diesel engines, heavy-duty natural-gas-fueled and liquefied-petroleum-gas-fueled engines derived from diesel-cycle engines and for new 1993 through 2003 model heavy-duty methanol-fueled diesel engines – No change]*

(a)(3) *[Formaldehyde exhaust emission standards from new 1993 and subsequent model methanol-fueled diesel engines – No change]*

(a)(4) *[Optional certification requirements for bi-fueled heavy-duty engines – No change]*

(a)(5) *[Crankcase emission requirements for new 2007 and subsequent model heavy-duty diesel engines – No change]*

(a)(6) *[Engine idling requirements for 2008 and subsequent model heavy-duty diesel engines – No change]*

(a)(7) Greenhouse Gas Emission Standards for new 2014 and Subsequent Model Heavy-Duty Diesel Engines, Heavy-Duty Natural Gas-Fueled and Liquefied-Petroleum-Gas-Fueled Engines Derived from Diesel-Cycle Engines, and Heavy-Duty Methanol-Fueled Diesel Engines.

(A) The CO_2 emissions from new 2014 and subsequent model heavy-duty diesel engines, heavy-duty natural gas-fueled and liquefied-petroleum-gas-fueled engines derived from diesel-cycle engines, and heavy-duty methanol-fueled diesel engines, except in all cases engines used in medium-duty vehicles, shall not exceed:

CO_2 Emission Standards for 2014 and Subsequent Model Heavy-Duty Diesel Engines[A, B, C]
(in g/hp-hr)

Model Years	Light heavy-duty – vocational	Medium heavy-duty – vocational	Heavy heavy-duty – vocational	Medium heavy-duty – tractor	Heavy heavy-duty – tractor
2014-2016	600	600	567	502	475
2017 and later	576	576	555	487	460

[A] *Family Certification Levels.* A Family Certification Level (FCL) must be specified for each engine family, which may not be less than the certified emission level for the engine family. The Family Emission Limit (FEL) for the engine family is equal to the FCL multiplied by 1.03. The FCL serves as the CO_2 emission standard for the engine family with respect to certification and confirmatory testing instead of the standards specified in this subsection (a)(7)(A). The FEL serves as the emission standard for the engine family with respect to all other testing.

[B] *Averaging, Banking, and Trading Program and Credits.* The requirements for the optional averaging, banking, and trading program and for generating credits are described in the applicable test procedures incorporated by reference in subsection (b).

[C] *Alternate Phase-in Emission Standards.* Alternate phase-in emission standards may be used in lieu of the required CO_2 emission standards in the table above. To qualify for these alternate phase-in emission standards, the manufacturer must begin certifying all of its model year 2013 diesel engines within a given primary intended service class to the applicable alternate emission standards of this footnote (c) and continue through model year 2016. This means that once a manufacturer chooses to certify a primary intended service class to the alternate emission standards of this footnote (c), it is not allowed to opt out of these standards. Engines certified to these alternate emission standards are not eligible for early credits. Note that these alternate emission standards for 2016 and later are the same as the otherwise applicable required emission standards for model year 2017 and later.

Alternate Phase-in CO_2 Emission Standards (in g/hp-hr)					
Model Years	Light heavy-duty – vocational	Medium heavy-duty – vocational	Heavy heavy-duty – vocational	Medium heavy-duty – tractor	Heavy heavy-duty – tractor
2013-2015	618	618	577	512	485
2016	576	576	555	487	460

[D] *Alternate Emission Standards Based on 2011 Model Year Engines.* For model years 2014 through 2016, heavy-duty diesel engines may be certified to these alternate emission standards based on 2011 model year engines, if they are not part of an averaging set in which a balance of banked credits remain. These alternate standards are determined from the measured emission rate of the test engine of the applicable baseline 2011 engine family(ies) as described in the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles," as incorporated by reference in section (b). The alternate CO_2 standard for light and medium heavy-duty vocational-certified engines is equal to the baseline 2011 emission rate multiplied by 0.975. The alternative CO_2 standard for tractor-certified engines and all other heavy heavy-duty engines is equal to the baseline 2011 emission rate multiplied by 0.970.

(B) The methane (CH_4) emissions from new 2014 and subsequent model heavy-duty diesel engines, heavy-duty natural gas-fueled and liquefied-petroleum-gas-fueled engines derived from diesel-cycle engines, and heavy-duty methanol-fueled diesel engines, except in all cases engines used in medium-duty vehicles, shall not exceed 0.10 g/hp-hr.

Date of Release: October 23, 2013
Date of Hearing: December 12, 2013

(C) The nitrous oxide (N_2O) emissions from new 2014 and subsequent model heavy-duty diesel engines, heavy-duty natural gas-fueled and liquefied-petroleum-gas-fueled engines derived from diesel-cycle engines, and heavy-duty methanol-fueled diesel engines, except in all cases engines used in medium-duty vehicles, shall not exceed 0.10 g/hp-hr.

(b) *Test Procedures.* The test procedures for determining compliance with standards applicable to 1985 and subsequent model heavy-duty diesel engines and vehicles and the requirements for participating in the averaging, banking and trading programs, are set forth in the "California Exhaust Emission Standards and Test Procedures for 1985 through 2003 Model Heavy-Duty Diesel-Engines and Vehicles," adopted April 8, 1985, as last amended December 12, 2002, the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles," adopted December 12, 2002, as last amended ~~April 18, 2013~~ [INSERT DATE OF AMENDMENT], and the "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes," adopted October 24, 2002, which are incorporated by reference herein.

(c)(1) *[Exhaust emission standards for 1987 and subsequent model heavy-duty Otto-cycle engines – No change]*

(c)(2) *[Formaldehyde exhaust emission standards for new 1993 and subsequent model methanol-fueled Otto-cycle engines – No change]*

(c)(3) *Optional Standards for Complete and Incomplete Heavy-Duty Vehicles that Use Heavy-Duty Otto-Cycle Engines. [No change]*

(c)(4) Greenhouse Gas Emission Standards for New 2016 and Subsequent Model Heavy-Duty Otto-Cycle Engines.

(A) The CO_2 emissions from new 2016 and subsequent model heavy-duty Otto-cycle engines, except in all cases engines used in medium-duty vehicles, shall not exceed 627 g/hp-hr. An FCL must be specified for each engine family, which may not be less than the certified emission level for the engine family. The FEL for the engine family is equal to the FCL multiplied by 1.03. The FCL serves as the CO_2 emission standard for the engine family with respect to certification and confirmatory testing instead of the standard specified in this subsection (c)(4)(A). The FEL serves as the emission standard for the engine family with respect to all other testing. The requirements for the optional averaging, banking, and trading program and for generating credits are described in the applicable test procedures incorporated by reference in subsection (d).

(B) The CH_4 emissions from new 2016 and subsequent model heavy-duty Otto-cycle engines, except in all cases engines used in medium-duty vehicles, shall not exceed 0.10 g/hp-hr.

(C) The N_2O emissions from new 2016 and subsequent model heavy-duty Otto-cycle engines, except in all cases engines used in medium-duty vehicles, shall not exceed 0.10 g/hp-hr.

(d) The test procedures for determining compliance with standards applicable to 1987 and subsequent model heavy-duty Otto-cycle engines and vehicles are set forth in the "California Exhaust Emission Standards and Test Procedures for 1987 through 2003 Model Heavy-Duty Otto-Cycle Engines and Vehicles," adopted April 25, 1986, as last amended December 27, 2000, the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles," adopted December 27, 2000, as last amended ~~April 18, 2013~~[INSERT DATE OF AMENDMENT], the "California Non-Methane Organic Gas Test Procedures," adopted July 12, 1991, as last amended December 6, 2012, and the "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes," adopted October 24, 2002, which are incorporated by reference herein.

(e) A manufacturer may elect to certify complete heavy-duty vehicles of 14,000 pounds or less maximum gross vehicle weight rating as medium-duty vehicles under section 1960.1 or section 1961 of this chapter, in which event the heavy-duty emission standards and test procedures in this section shall not apply.

(f) *[Use of engines certified to meet federal emission standards when the executive officer has determined that no engine certified to meet California emission standards exists which is suitable for use in the vehicles – No change]*

(g) *[Exhaust emission standards from 1995 through 2003 model engines used in incomplete medium-duty vehicles or diesel engines used in medium-duty vehicles – No change]*

(h)(1) *[Exhaust emission standards from 1992 through 2004 model Otto-cycle engines used in incomplete medium-duty low-emission vehicles, ultra-low-emission vehicles, and super-ultra-low-emission vehicles – No change]*

(h)(2) *[Exhaust emission standards from 1992 and subsequent model diesel engines used in medium-duty low-emission vehicles, ultra-low-emission vehicles and super-ultra-low-emission vehicles – No change]*

(h)(3) *[Phase-in option for 2007 and later model year engines subject to (h)(2) – No change]*

(h)(4) *[Crankcase emission requirements for new 2007 and subsequent model diesel engines used in medium-duty low-emission vehicles, ultra-low-emission vehicles and super-ultra-low-emission vehicles – No change]*

(h)(5) *[Optional Standards for Complete and Incomplete Heavy-Duty Vehicles that Use Heavy-Duty Diesel Engines - No change]*

(h)(6) Greenhouse Gas Emission Standards for New 2014 and Subsequent Model Heavy-Duty Diesel Engines and 2016 and Subsequent Heavy-Duty Otto-Cycle Engines Used in Medium-Duty Low-Emission Vehicles, Ultra-Low-Emission Vehicles, and Super-Ultra-Low-Emission Vehicles.

(A) The CO_2 emissions from new 2014 and subsequent model heavy-duty diesel engines and new 2016 and subsequent heavy-duty Otto-cycle engines used in medium-duty low-emission vehicles, ultra-low-emission vehicles, and super-ultra-low-emission vehicles shall not exceed:

CO_2 Emission Standards for 2014 and Subsequent Model Heavy-Duty Diesel Engines and 2016 and Subsequent Model Heavy-Duty Otto-Cycle Engines Used in Medium-Duty Low-Emission Vehicles, Ultra-Low-Emission Vehicles, and Super-Ultra-Low Emission Vehicles[A, B]

(in g/hp-hr)

Model Years	*Diesel Engines*[C]	*Otto-Cycle Engines*
2014	600	-
2015	600	-
2016	600	627
2017 and later	576	627

[A] *Family Certification Levels.* An FCL must be specified for each engine family, which may not be less than the certified emission level for the engine family. The FEL for the engine family is equal to the FCL multiplied by 1.03. The FCL serves as the CO_2 emission standard for the engine family with respect to certification and confirmatory testing instead of the standards specified in this subsection (h)(6)(A). The FEL serves as the emission standard for the engine family with respect to all other testing.

[B] *Averaging, Banking, and Trading Program and Credits.* The requirements for the optional averaging, banking, and trading program and for generating credits are described in the applicable test procedures incorporated by reference in subsection (b).

[C] *Alternate Emission Standards Based on 2011 Model Year Engines.* For model years 2014 through 2016, heavy-duty diesel engines may be certified to these alternate emission standards if they are not part of an averaging set in which a balance of banked credits remain. These alternate standards are determined from the measured emission rate of the test engine of the applicable baseline 2011 engine family(ies) as described in the California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles, as incorporated by reference in section (b). The alternate CO_2 standard for light heavy-duty vocational-certified engines is equal to the baseline 2011 emission rate multiplied by 0.975.

(B) The CH_4 emissions from new 2014 and subsequent model heavy-duty diesel engines and new 2016 and subsequent heavy-duty Otto-cycle engines used in medium-duty low-emission vehicles, ultra-low-emission vehicles, and super-ultra-low-emission vehicles shall not exceed 0.10 g/hp-hr.

(C) The N_2O emissions from new 2014 and subsequent model heavy-duty diesel engines and new 2016 and subsequent heavy-duty Otto-cycle engines used in medium-duty low-emission vehicles, ultra-low-emission vehicles, and super-ultra-low-emission vehicles shall not exceed 0.10 g/hp-hr.

(i) Definitions Specific to this Section. The following definitions apply to this section 1956.8.

(1) "Certified emission level" means the highest deteriorated emission level in an engine family for a given pollutant from the applicable transient and/or steady-state testing, rounded to the same number of decimal places as the applicable standard. Note that there may be two certified emission levels for CO_2 if a family is certified for both vocational and tractor use.

(2) "Emission standard," as it applies to the compliance with the standards set forth in this section, and the remedies provided for in the Health and Safety Code for noncompliance, relates to the emission characteristics of a motor vehicle or motor vehicle engine and means:

(a) a numerical limit on the amount of a given pollutant that a motor vehicle or motor vehicle engine may emit into the atmosphere; or

(b) a requirement that a motor vehicle or motor vehicle engine be equipped with a certain type of pollution-control device or some other design feature related to the control of emissions.

(3) "Evaporative emission standards" are a subset of emission standards that collectively refer to the specific motor vehicle fuel evaporative emission standards and test procedures incorporated by reference in title 13, CCR section 1976 to which a vehicle is certified.

(4) "Exhaust emission standards" or "tailpipe emission standards" are a subset of emission standards that collectively refer to the specific standards or family certification Level (FCL) and family emission limit (FEL) emission levels to which an engine is certified.

(5) "Family certification level" (FCL) means a CO_2 emission level declared by the manufacturer that is at or above emission test results for all emission-data engines. The FCL serves as the emission standard for the engine family with respect to certification testing if it is different than the otherwise applicable standard. The FCL must be expressed to the same number of decimal places as the emission standard it replaces.

(6) "Family emission limit" (FEL) means an emission level declared by the manufacturer to serve in place of an otherwise applicable emission standard (other than CO_2 standards) under the Average, Banking, and Trading Program. The FEL must be expressed to the same number of decimal places as the emission standard it replaces. The FEL serves as the emission standard for the engine family with respect to all required testing except certification testing for CO_2. The CO_2 FEL is equal to the CO_2 FCL multiplied by 1.03 and rounded to the same number of decimal places as the standard (e.g., the nearest whole g/hp-hr for the 2016 CO_2 standards).

(7) "Heavy heavy-duty engine" means an engine used in a vehicle that normally exceeds 33,000 pounds GVWR. Heavy heavy-duty engines are designed for multiple rebuilds and have cylinder liners. Vehicles in this group are normally tractors, trucks, and buses used in inter-city, long-haul applications.

(8) "Light heavy-duty engine" means an engine used in a vehicle that is normally below 19,500 pounds GVWR. Light heavy-duty engines usually are not designed for rebuild and do not have cylinder liners. Vehicle body types in this group might include any heavy-duty vehicle built for a light-duty truck chassis, van trucks, multi-stop vans, motor homes and other recreational vehicles, and some straight trucks with a single rear axle. Typical applications would include personal transportation, light-load commercial delivery, passenger service, agriculture, and construction.

(9) "Medium heavy-duty engine" mean an engine used in a vehicle that is normally between 19,500 to 33,000 pounds GVWR. Medium heavy-duty engines may be designed for rebuild and may have cylinder liners. Vehicle body types in this group would typically include school buses, straight trucks with dual rear axles, city tractors, and a variety of special purpose vehicles such as small dump trucks, and refuse trucks. Typical applications would include commercial short haul and intra-city delivery and pickup.

(10) "Primary intended service class" means the class that best describes the vehicle for which the manufacturer designs and markets the engine. The three primary intended service classes are light heavy-duty, medium heavy-duty, and heavy heavy-duty.

(11) "Tractor" means a vehicle meeting the definition of "tractor" in 40 CFR §1037.801, but not classified as a "vocational tractor" under 40 CFR §1037.630, or relating to such a vehicle.

(12) "Tractor engine" means an engine certified for use in tractors. Where an engine family is certified for use in both tractors and vocational vehicles, "tractor engine" means an engine that the engine manufacturer reasonably believes will be (or has been) installed in a tractor. Note that the Executive Officer may require a manufacturer to document how it determines that an engine is a tractor engine.

(13) "Vocational engine" means an engine certified for use in vocational vehicles. Where an engine family is certified for use in both tractors and vocational vehicles, "vocational engine" means an engine that the engine manufacturer reasonably believes will be (or has been) installed in a vocational vehicle. Note that the provisions of this part may require a manufacturer to document how it determines that an engine is a vocational engine.

(14) "Vocational vehicle" means a vehicle meeting the definition of "vocational" vehicle in 40 CFR §1037.801.

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39500, 39600, 39601, 43013, 43018, 43100, 43101, 43102, 43104, 43105, 43106, 43107 and 43806, Health and Safety Code; and Section 28114, Vehicle Code. Reference: Sections 38501, 38505, 38510, 38560, 38580, 39002, 39003, 39500, 39600, 39601, 39610, 39667, 43000, 43000.5, 43009.5, 43013, 43017, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43107, 43202, 43204, 43205, 43205.5, 43206, 43210, 43211, 43212, 43213 and 43806, Health and Safety Code; and Section 28114, Vehicle Code.

3.) Amend section 2036, title 13, CCR, to read as follows:

§ 2036. Defects Warranty Requirements for 1979 Through 1989 Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles; 1979 and Subsequent Model Motorcycles and Heavy-Duty Vehicles; and Motor Vehicle Engines Used in Such Vehicles.

* * * *

(c) Warranty Period.

* * * *

(4) In the case of diesel-powered heavy-duty vehicles (except medium-duty vehicles), and motor vehicle engines used in such vehicles, a period of use of five years, 100,000 miles, or 3000 hours of operations, whichever first occurs. However, in no case may this period be less than the basic mechanical warranty that the manufacturer provides (with or without additional charge) to the purchaser of the engine. Extended warranties on select parts do not extend the emissions warranty requirements for the entire engine but only for those parts. In cases where responsibility for an extended warranty is shared between the owner and the manufacturer, the emissions warranty shall also be shared in the same manner as specified in the warranty agreement.

(4.1) In the case of diesel-powered heavy-duty vehicles below 19,500 pound GVWR (except medium-duty vehicles) certified to the GHG emission standards of section 95663, title 17, and motor vehicle engines used in such vehicles, a period of use of five years or 50,000 miles, whichever first occurs, for GHG emission control components, as set forth in 40 CFR 1037.120, as adopted November 14, 2011.

(4.2) In the case of diesel-powered heavy-duty vehicles at or above 19,500 pound GVWR certified to the GHG emission standards of section 95663, title 17, and motor vehicle engines used in such vehicles, a period of use of five years or 100,000 miles, whichever first occurs, for GHG emission control components, as set forth in 40 CFR 1037.120, as adopted November 14, 2011.

* * * *

(8) In the case of heavy-duty vehicles and motor vehicle engines used in such vehicles, (except for diesel-powered heavy-duty vehicles or all medium-duty vehicles, and motor vehicle engines used in such vehicles,) a period of use of five years or 50,000 miles, whichever first occurs. However, in no case may this period be less than the basic mechanical warranty period that the manufacturer provides (with or without additional charge) to the purchaser of the engine. Extended warranties on select parts do not extend the emissions warranty requirements for the entire engine but only for those parts. In cases where responsibility for an extended warranty is shared between

the owner and the manufacturer, the emissions warranty shall also be shared in the same manner as specified in the warranty agreement.

(8.1) In the case of heavy-duty vehicles certified to the GHG emission standards of section 95663, title 17, and motor vehicle engines used in such vehicles, (except for diesel-powered heavy-duty vehicles or all medium-duty vehicles, and motor vehicle engines used in such vehicles), a period of use of five years or 50,000 miles, whichever first occurs, for GHG emission control components, as set forth in 40 CFR 1037.120, as adopted November 14, 2011.

* * * *

Note: Authority cited: Sections 38501, 38505, 38510, 38560, 39600 and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 43106, 43204, 43205.5, 44004, 44010, 44011, 44012, 44015, and 44017, Health and Safety Code.

4.) Amend section 2037, title 13, CCR, to read as follows:

§ 2037. Defects Warranty Requirements for 1990 and Subsequent Model Passenger Cars, Light-Duty Trucks, Medium-Duty Vehicles, and Motor Vehicle Engines Used in Such Vehicles.

(a) Applicability.

This section shall apply to 1990 and subsequent model passenger cars, light-duty trucks, medium-duty vehicles, and motor vehicle engines used in such vehicles. The warranty period shall begin on the date the vehicle is delivered to an ultimate purchaser, or if the vehicle is first placed in service as a "demonstrator" or "company" car prior to delivery, on the date it is first placed in service.

(a.1) This section shall apply to medium-duty vehicles certified to the GHG emission standards of section 95663, title 17, for GHG emission control components, as set forth in 40 CFR 1037.120, as adopted November 14, 2011.

(b) General Emissions Warranty Coverage.

The manufacturer of each motor vehicle or motor vehicle engine shall warrant to the ultimate purchaser and each subsequent purchaser that the vehicle or engine is:

(1) Designed, built, and equipped so as to conform with all applicable regulations adopted by the Air Resources Board pursuant to its authority in chapters 1 and 2, part 5, division 26 of the Health and Safety Code; and

(2) Free from defects in materials and workmanship which cause the failure of a warranted part to be identical in all material respects to the part as described in the vehicle or engine manufacturer's application for certification, including any defect in materials or workmanship which would cause the vehicle's on-board diagnostic malfunction indicator light to illuminate, for a period of three years or 50,000 miles, whichever first occurs; and

(3) Free from defects in materials and workmanship which cause the failure of a warranted part described in section (c) below for seven years or 70,000 miles, whichever first occurs.

* * * *

Note: Authority cited: Sections 38501, 38505, 38510, 38560, 39600 and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 43106, 43204, 43205, 44004, 44010, 44011, 44012, 44015, and 44017, Health and Safety Code.

5.) Amend section 2112, title 13, CCR, to read as follows:

§ 2112. Definitions.

* * * *

(l) "Useful life" means, for the purposes of this article:

* * * *

(19) For 2004 and subsequent model-year light heavy-duty diesel engines, for carbon monoxide, particulate, and oxides of nitrogen plus non-methane hydrocarbons emissions standards, a period of use of 10 years or 110,000 miles, whichever first occurs, or any alternative useful life period approved by the Executive Officer.

(19.1) For 2004 and subsequent model-year light heavy-duty diesel engines certified to the Greenhouse Gas emission standards in section 1956.8(a)(7), title 13, CCR, for carbon dioxide, nitrous oxide, and methane emission standards, a period of use of ten years or 110,000 miles, whichever first occurs, or any alternative useful life period approved by the Executive Officer.

(20) For 2004 and subsequent model-year medium heavy-duty diesel engines, for carbon monoxide, particulate, and oxides of nitrogen plus non-methane hydrocarbons emissions standards, a period of use of ten years or 185,000 miles, whichever first occurs; or any alternative useful life period approved by the Executive Officer.

(20.1) For 2004 and subsequent model-year medium heavy-duty diesel engines certified to the Greenhouse Gas emission standards in section 1956.8(a)(7), title 13, CCR, for carbon dioxide, nitrous oxide, and methane emission standards, a period of use of ten years or 185,000 miles, whichever first occurs, or any alternative useful life period approved by the Executive Officer.

(21) For 2004 and subsequent model-year heavy heavy-duty diesel engines, 2004 and subsequent model-year heavy-duty diesel urban buses, 2004 and subsequent model-year heavy-duty diesel engines to be used in urban buses, and 2004 and subsequent model year hybrid-electric urban buses for carbon monoxide, particulate, and oxides of nitrogen plus non-methane hydrocarbon emissions standards, a period of use of 10 years or 435,000 miles, or 22,000 hours, whichever first occurs, or any alternative useful life period approved by the Executive Officer, except as provided in paragraphs (~~20~~21)(A) and (~~20~~21)(B).

(21.1) For 2004 and subsequent model-year heavy heavy-duty diesel engines certified to the Greenhouse Gas emission standards in section 1956.8(a)(7), title 13, CCR, for carbon dioxide, nitrous oxide, and methane emission standards, a period of use of ten years or 435,000 miles, or 22,000 hours, whichever first occurs, or any alternative useful life period approved by the Executive Officer, except as provided in paragraphs (21)(A) and (21)(B).

(A) The useful life limit of 22,000 hours in paragraph (19) of this definition is effective as a limit to the useful life only when an accurate hours meter is provided by the manufacturer with the engine and only when such hours meter can reasonably be expected to operate properly over the useful life of the engine.

(B) For an individual engine, if the useful life hours limit of 22,000 hours is reached before the engine reaches 10 years or 100,000 miles, the useful life shall become 10 years or 100,000 miles, whichever occurs first, as required under Clean Air Act section 202(d) (42 U.S.C. 7521(d)).

(22) For 2004 and subsequent model-year heavy-duty Otto-cycle engines, for carbon monoxide, particulate, and oxides of nitrogen plus non-methane hydrocarbon emissions standards, a period of use of 10 years or 110,000 miles, whichever first occurs.

(22.1) For 2004 and subsequent model-year heavy-duty Otto-cycle engines certified to the Greenhouse Gas emission standards in section 1956.8(h)(6), title 13, CCR, for carbon dioxide, nitrous oxide, and methane emissions standards, the useful life shall be a period of use of ten years or 110,000 miles, whichever first occurs.

* * * *

(25) For 2014 and subsequent model-year heavy-duty vehicles at or below 19,500 pounds GVWR, certified to the GHG emission standards of section 95663, title 17, CCR, the useful life shall be ten years or 110,000 miles, whichever first occurs.

(26) For 2014 and subsequent model-year heavy-duty vehicles above 19,500 pounds and at or below 33,000 pounds GVWR, certified to the GHG emission standards of section 95663, title 17, CCR, the useful life shall be ten years or 185,000 miles, whichever first occurs.

(27) For 2014 and subsequent model-year heavy-duty vehicles above 33,000 pounds GVWR, certified to the GHG emission standards of section 95663, title 17, CCR, the useful life shall be ten years or 435,000 miles, whichever first occurs.

* * * *

Note: Authority cited: Sections 38501, 38505, 38510, 38560, 39010, 39600, 39601, 43013, 43018, 43101, 43104, 43105 and 43806, Health and Safety Code; and Section 28114, Vehicle Code. Reference: Sections 38501, 38505, 38510, 38560, 39002, 39003, 39010, 39500, 39601, 43000, 43009.5, 43013, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43107, 43202, 43204-43205.5, 43206, 43210, 43211, 43212, 43213 and 43806, Health and Safety Code; and Section 28114, Vehicle Code.

6.) Amend section 2139, title 13, CCR, to read as follows:

§ 2139. Testing.

* * * *

(b) For medium-duty vehicles certified according to the chassis standards and test procedures specified in section 1960.1, 1961, 1961.2, or 1961.3, Title 13, California Code of Regulations and the documents incorporated by reference therein, in-use compliance emission tests shall be performed pursuant to section 1960.1, 1961, 1961.2, or 1961.3, Title 13, California Code of Regulations, as applicable.

(b.1) For medium-duty vehicles certified according to the GHG emission standards of section 95663, Title 17, California Code of Regulations, and the documents incorporated by reference therein, in-use compliance emission tests shall be performed pursuant to section 95663, Title 17, California Code of Regulations, as applicable.

(c) For medium-duty engines and vehicles certified according to the optional engine test procedures specified in section 1956.8, Title 13, California Code of Regulations and the documents incorporated by reference therein, in-use compliance emission tests shall be performed pursuant to one of the following procedures:

(c.1) For medium-duty engines and vehicles certified to the Greenhouse Gas emission standards in sections 1956.8(a)(7) and 1956.8(h)(6), Title 13, California Code of Regulations, in-use compliance emission tests shall be performed pursuant to one of the following procedures:

* * * *

(2) Medium-duty vehicles may be tested according to the chassis test procedures specified in section 1960.1(k), 1961, ~~or~~ 1961.2, Title 13, California Code of Regulations or section 95663, Title 17, California Code of Regulations, as applicable, if a manufacturer develops correlation factors which establish the relationship between engine and chassis testing for each engine family or test group and submits these correlation factors within one year after the beginning of production.

* * * *

(d) For heavy-duty engines and vehicles, in-use compliance emission tests shall be performed pursuant to section 1956.8, Title 13, California Code of Regulations. For heavy-duty vehicles certified to the GHG emission standards of section 95663, Title 17, California Code of Regulations, in-use compliance emission tests shall be performed pursuant to section 95663, Title 17, California Code of Regulations.

* * * *

Note: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018, 43101, 43104 and 43105, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 39002, 39003, 43000, 43009.5, 43013, 43018, 43100, 43101, 43101.5, 43102, 43103, 43104, 43105, 43106, 43107, 43204-43205.5 and 43211-43213, Health and Safety Code.

7.) Amend section 2140, title 13, CCR, to read as follows:

§ 2140. Notification and Use of Test Results.

* * * *

(b) If the results of the in-use vehicle emission tests conducted pursuant to Section 2139 indicate that the average emissions of the test vehicles for any pollutant exceed the applicable emission standards specified in Title 13, California Code of Regulations, Sections 1960.1, 1961, 1961.2, 1961.3, 1956.8, 1958, 2412, 2423 or 2442 or in Title 17, California Code of Regulations, Section 95663, the entire vehicle population so represented shall be deemed to exceed such standards. The Executive Officer shall notify the manufacturer of the test results and upon receipt of the notification, the manufacturer shall have 45 days to submit an influenced recall plan in accordance with Sections 2113 through 2121, Title 13, California Code of Regulations. If no such recall plan is submitted, the Executive Officer may order corrective action including recall of the affected vehicles in accordance with Sections 2122 through 2135, Title 13, California Code of Regulations.

Note: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601, 43013, 43018 and 43105, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43013, 43018, 43101, 43104, 43105, 43106, 43107, 43204-43205.5 and 43211-43213, Health and Safety Code.

8.) Amend section 2147, title 13, CCR, to read as follows:

§ 2147. Demonstration of Compliance with Emission Standards.

* * * *

(b) A manufacturer may test properly maintained in-use vehicles with the failed emission-related component pursuant to the applicable certification emission tests specified in Title 13, California Code of Regulations, Section 1960.1, 1961, 1961.2, or 1961.3, as applicable, for passenger cars, light-duty trucks, and medium-duty vehicles, Section 1956.8 for heavy-duty engines and vehicles, Section 1958 for motorcycles, and Section 2442 for sterndrive/inboard marine engines, and in Title 17, California Code of Regulations, Section 95663, for heavy-duty vehicles. The emissions shall be projected to the end of the vehicle's or engine's useful life using in-use deterioration factors. The in-use deterioration factors shall be chosen by the manufacturer from among the following:

* * * *

(3) subject to approval by the Executive Officer, a manufacturer-generated deterioration factor. The Executive Officer shall approve such deterioration factor if it is based on in-use data generated from certification emission tests performed on properly maintained and used vehicles in accordance with the procedures set forth in Section 1960.1, 1961, or 1961.2 of Title 13 of the California Code of Regulations, as applicable, for passenger cars, light-duty trucks, and medium-duty vehicles; Section 1956.8 of Title 13 of the California Code of Regulations heavy duty vehicles and engines; ~~and~~ Section 1958 of Title 13 of the California Code of Regulations for motorcycles; and Section 95663 of Title 17 of the California Code of Regulations, for heavy-duty vehicles, and if the vehicles from which it was derived are representative of the in-use fleet with regard to emissions performance and are equipped with similar emission control technology as vehicles with the failed component.

* * * *

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39600, 39601 and 43105, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 43000, 43009.5, 43018, 43101, 43104, 43105, 43106, 43107 and 43204-43205.5, Health and Safety Code.

9.) Adopt new subarticle 12, section 95660, title 17, CCR, to read as follows:

(Note: The entire text of section 95660 set forth below is new language proposed to be added to the CCR.)

Title 17. Public Health
Division 3. Air Resources
Chapter 1. Air Resources Board
Subchapter 10. Climate Change
Article 4. Regulations to Achieve Greenhouse Gas Emission Reductions
Subarticle 12. Greenhouse Gas Emission Requirements for New 2014 and Subsequent Model Heavy-Duty Vehicles

§95660. Purpose.

The purpose of this subarticle is to reduce greenhouse gas (GHG) emissions from new medium- and heavy-duty vehicles by establishing emission standards and other requirements applicable to such vehicles. These greenhouse gas emissions include: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), and hydrofluorocarbons (HFCs).

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39010, 39600, 39601, 43013, 43018, 43101, 43104, and 43105, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 38580, 39002, 39003, 39600, 39601, 43000, 43009.5, 43013, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43205, 43205.5, and 43211, Health and Safety Code.

10.) Adopt new section 95661, title 17, CCR, to read as follows:

(Note: The entire text of section 95661 set forth below is new language proposed to be added to the CCR.)

§95661. Applicability.

This subarticle applies to all new 2014 and subsequent model medium- and heavy-duty vehicles, including vehicles fueled by conventional and alternative fuels, and electric vehicles. This subarticle contains emission standards and test procedures incorporated by reference that control greenhouse gas emissions from such vehicles.

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39010, 39600, 39601, 43013, 43018, 43101, 43104, and 43105, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 38580, 39002, 39003, 39600, 39601, 43000, 43009.5, 43013, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43205, 43205.5, and 43211, Health and Safety Code.

11.) Adopt new section 95662, title 17, CCR, to read as follows:

(Note: The entire text of section 95662 set forth below is new language proposed to be added to the CCR.)

§95662. Definitions.

(a) The definitions in Section 1900(b), chapter 1, title 13 of the California Code of Regulations (CCR) apply to these procedures with the following additions:

(1) "Diesel" means relating to a type of reciprocating, internal combustion engine that is not an Otto-cycle engine.

(2) "Day cab" means a type of tractor cab that is not a sleeper cab.

(3) "Deteriorated emission level" means the emission level that results from applying the appropriate deterioration factor to the official emission result of the emission-data vehicle. Note that where no deterioration factor applies, references in this part to the deteriorated emission level mean the official emission result.

(4) "Emission standard," as it applies to compliance with the Greenhouse Gas Requirements for new 2014 and subsequent model medium and heavy-duty vehicles, and the remedies provided for in the Health and Safety Code for noncompliance, relates to the emission characteristics of a motor vehicle and means:

(A) a numerical limit on the amount of a given pollutant that a motor vehicle engine may emit into the atmosphere; or

(B) a requirement that a motor vehicle engine be equipped with a certain type of pollution-control device or some other design feature related to the control of emissions.

(5) "Gross combination weight rating" (GCWR) means the value specified by the vehicle manufacturer as the maximum weight of a loaded vehicle and trailer, consistent with good engineering judgment. For example, compliance with SAE J2807 is generally considered to be consistent with good engineering judgment, especially for Class 3 and smaller vehicles.

(6) "Gross vehicle weight rating" (GVWR) means the value specified by the vehicle manufacturer as the maximum design loaded weight of a single vehicle, consistent with good engineering judgment.

(7) "Heavy-duty engine" means any engine used for (or for which the engine manufacturer could reasonably expect to be used for) motive power in a heavy-duty vehicle.

(8) "Heavy-duty vehicle" means any motor vehicle above 8,500 pounds GVWR or that has a vehicle curb weight above 6,000 pounds or that has a basic vehicle frontal area greater than 45 square feet.

(9) "Manufacturer" means any person engaged in the manufacturing or assembling of new motor vehicles or new motor vehicle engines, or importing such vehicles or engines for resale, or who acts for and is under the control of any such person in connection with the distribution of new motor vehicles and new motor vehicle engines, but shall not include any dealer with respect to new motor vehicles or new motor vehicle engines received by him in commerce. In general, this term includes any person who manufactures a vehicle or vehicle for sale in California or otherwise introduces a new motor vehicle into commerce in California. This includes importers who import vehicles or vehicles for resale.

(10) "Medium-duty engine" means any heavy-duty engine that is used to propel a medium-duty vehicle.

(11) "Medium-duty vehicle" means any heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission vehicle certified to the standards in title 13, CCR section 1956.8(h), having a manufacturer's gross vehicle weight rating between 8,501 and 14,000 pounds.

(12) "Model year" means the manufacturer's annual new model production period, except as restricted under this definition and 40 CFR part 85, subpart X. It must include January 1 of the calendar year for which the model year is named, may not begin before January 2 of the previous calendar year, and it must end by December 31 of the named calendar year.

(A) The manufacturer who holds the Executive Order for the vehicle must assign the model year based on the date when its manufacturing operations are completed relative to its annual model year period. In unusual circumstances where completion of your assembly is delayed, we may allow you to assign a model year one year earlier, provided it does not affect which regulatory requirements will apply.

(B) Unless a vehicle is being shipped to a secondary manufacturer that will hold the Executive Order, the model year must be assigned prior to introduction of the vehicle into California commerce. The certifying manufacturer must redesignate the model year if it does not complete its manufacturing operations within the originally identified model year. A vehicle introduced into California commerce without a model year is deemed to have a model year equal to the calendar year of its introduction into California commerce unless the certifying manufacturer assigns a later date.

(13) "Motor vehicle" has the meaning given in Health and Safety Code section 39039.

(14) "Sleeper cab" means a type of tractor cab that has a compartment behind the driver's seat intended to be used by the driver for sleeping. This includes cabs accessible from the driver's compartment and those accessible from outside the vehicle.

(15) "Otto-cycle" means relating to a gasoline-fueled engine or any other type of engine with a spark plug (or other sparking device) and with operating characteristics significantly similar to the theoretical Otto combustion cycle. Otto-cycle engines usually use a throttle to regulate intake air flow to control power during normal operation.

(16) "Tractor" has the meaning given for "truck tractor" in 49 CFR §571.3. This includes most heavy-duty vehicles specifically designed for the primary purpose of pulling trailers but does not include vehicles designed to carry other loads. For purposes of this definition "other loads" would not include loads carried in the cab, sleeper compartment, or toolboxes. Examples of vehicles that are similar to tractors but that are not tractors under this part include dromedary tractors, automobile haulers, straight trucks with trailers hitches, and tow trucks. Note that the provisions of this part that apply for tractors do not apply for tractors that are classified as vocational tractors under 40 CFR §1037.630.

(17) "Useful life" means the period during which a vehicle is required to comply with all applicable emission standards.

(18) "Vehicle" means equipment intended for use on highways that meets the criteria of paragraph (A)1. or (A)2. of this definition, as follows:

(A) The following equipment are vehicles:

1. A piece of equipment that is intended for self-propelled use on highways becomes a vehicle when it includes at least an engine, a transmission, and a frame. (Note: For purposes of this definition, any electrical, mechanical, and/or hydraulic devices attached to engines for the purpose of powering wheels are considered to be transmissions.)

2. A piece of equipment that is intended for self-propelled use on highways becomes a vehicle when it includes a passenger compartment attached to a frame with axles.

(B) Vehicles may be complete or incomplete vehicles as follows:

1. A complete vehicle is a functioning vehicle that has the primary load carrying device or container (or equivalent equipment) attached. Examples of equivalent equipment would include fifth wheel trailer hitches, firefighting equipment, and utility booms.

2. An incomplete vehicle is a vehicle that is not a complete vehicle. Incomplete vehicles may also be cab-complete vehicles. This may include vehicles sold to secondary vehicle manufacturers.

3. The primary use of the terms "complete vehicle" and "incomplete vehicle" are to distinguish whether a vehicle is complete when it is first sold as a vehicle.

4. You may ask us to allow you to certify a vehicle as incomplete if you manufacture the engines and sell the unassembled chassis components, as long as you do not produce and sell the body components necessary to complete the vehicle.

(C) Equipment such as trailers that are not self-propelled are not "vehicles" under 40 CFR part 1037.

(19) "Vocational tractor" means a vehicle classified as a vocational tractor under 40 CFR §1037.630. Vocational vehicle means relating to a vehicle subject to the standards of 40 CFR §1037.105 (including vocational tractors).

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39010, 39600, 39601, 43013, 43018, 43101, 43104, and 43105, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 38580, 39002, 39003, 39600, 39601, 43000, 43009.5, 43013, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43205, 43205.5, and 43211, Health and Safety Code.

12.) Adopt new section 95663, title 17, CCR, to read as follows:

(Note: The entire text of section 95663 set forth below is new language proposed to be added to the CCR.)

§95663. Greenhouse Gas Exhaust Emission Standards and Test Procedures for New 2014 and Subsequent Model Heavy-Duty Vehicles.

(a) GHG Exhaust Emission Standards for New 2014 and Subsequent Model Heavy-Duty Vehicles over 14,000 Pounds GVWR

(1) Diesel and Otto-Cycle Vocational Vehicles.

(A) The CO_2 emissions for new 2014 and subsequent model heavy-duty vehicles shall not exceed:

GVWR (pounds)	*CO_2 standard (g/ton-mile) for model years 2014 - 2016*	*CO_2 standard (g/ton-mile) for model year 2017 and later*
GVWR ≤ 19,500	388	373
19,500 < GVWR ≤ 33,000	234	225
GVWR > 33,000	226	222

1. *Averaging, Banking, and Trading and Credits.* The requirements for the optional averaging, banking, and trading program and for generating credits are described in the applicable test procedures incorporated by reference in section (c).
2. *Useful Life Requirements.* Heavy-duty vocational vehicles must comply with the emission standards in this subsection (a)(1)(A) throughout the full useful life, as follows:
   a. 110,000 miles or 10 years, whichever comes first, for vehicles at or below 19,500 pounds GVWR.
   b. 185,000 miles or 10 years, whichever comes first, for vehicles above 19,500 pounds GVWR and at or below 33,000 pounds GVWR.
   c. 435,000 miles or 10 years, whichever comes first, for vehicles above 33,000 pounds GVWR.

(2) Diesel and Otto-Cycle Tractors above 26,000 Pounds GVWR.

(A) The CO_2 emissions for new 2014 and subsequent model tractors above 26,000 pounds GVWR shall not exceed:

GVWR (pounds)	*Sub-Category*	*CO_2 standard (g/ton-mile) for model years 2014 – 2016*	*CO_2 standard (g/ton-mile) for model year 2017 and later*
26,000 < GVWR ≤ 33,000	Low-Roof (all cab styles)	107	104
	Mid-Roof (all cab styles)	119	115
	High-Roof (all cab styles)	124	120
GVWR > 33,000	Low-Roof Day Cab	81	80
	Low-Roof Sleeper Cab	68	66
	Mid-Roof Day Cab	88	86
	Mid-Roof Sleeper Cab	76	73
	High-Roof Day Cab	92	89
	High-Roof Sleeper Cab	75	72

1. *Averaging, Banking, and Trading Program and Credits.* The requirements for the optional averaging, banking, and trading program and for generating credits are described in the applicable test procedures incorporated by reference in section (c).
2. *Useful Life Requirements.* Heavy-duty tractors must comply with the emission standards in this subsection (a)(2)(A) throughout the full useful life, as follows:
   a. 185,000 miles or 10 years, whichever comes first, for vehicles above 26,000 pounds GVWR and at or below 33,000 pounds GVWR.
   b. 435,000 miles or 10 years, whichever comes first, for vehicles above 33,000 pounds GVWR.

(B) *Air Conditioning Leakage.* Loss of refrigerant from air conditioning systems from 2014 and later heavy-duty tractors may not exceed 1.50 percent per year, except as allowed by subsections (a)(2)(C)(1) and (a)(2)(C)(2) below.

1. For air condition refrigerants other than HFC–134a, the leakage rate is adjusted by multiplying it by the global warming potential of the refrigerant and dividing the product by 1430 (which is the global warming potential of HFC–134a).
2. If the total refrigerant capacity is less than 734 grams, the leakage rate may exceed 1.50 percent, as long as the total leakage rate does not exceed 11.0 grams per year.

(b) GHG Exhaust Emission Standards for New 2014 and Subsequent Model Diesel and Otto-Cycle Medium-Duty Vehicles between 8,501 to 14,000 Pounds GVWR

(1) Diesel and Otto-Cycle Vehicles between 8,501 to 14,000 Pounds GVWR.

(A) *Diesel Fleet-Average Emission Standards.*

1. *CO_2 Fleet-Average Standards.* For each model year, a manufacturer's national fleet-average CO_2 emissions for its diesel medium-duty vehicles shall not exceed the CO_2 fleet-average standard. The CO_2 fleet-average standard is calculated by a national production-weighted average of target values and rounded to the nearest 0.1 grams per mile, as follows:

$$Fleet\ Average\ Standard = \frac{\sum[Target_i \times Volume_i]}{\sum[Volume_i]}$$

The target values, for each vehicle configuration, are calculated as follows:

$$CO_2\ Target\ \left(\frac{g}{mile}\right) = 0.0416 \times WF + 320$$

where WF is the work factor.

$$WF = 0.75 \times (GVWR - Curb\ Weight + xwd) + 0.25 \times (GCWR - GVWR)$$

Where:
xwd = 500 pounds if the vehicle has four-wheel drive or all-wheel drive; xwd = 0 pounds for all other vehicles.

a. *Phase-In Provisions.* A manufacturer must choose either Option A or Option B below for phasing in the diesel fleet-average CO_2 target of this subsection (b)(1)(A).

Option A Phase-In Provisions for Diesel Fleet-Average CO_2 Target	
Vehicle model year	Option A CO_2 target (g/mile)
2014	[0.0478 × (WF)] + 368
2015	[0.0474 × (WF)] + 366
2016	[0.0460 × (WF)] + 354
2017	[0.0445 × (WF)] + 343
2018 and subsequent	[0.0416 × (WF)] + 320
Option B Phase-In Provisions for Diesel Fleet-Average CO_2 Target	
Vehicle model year	Option B CO_2 target (g/mile)
2014	[0.0478 × (WF)] + 368
2015	[0.0474 × (WF)] + 366
2016 – 2018	[0.0440 × (WF)] + 339
2019 and subsequent	[0.0416 × (WF)] + 320

b. *Useful Life*

Date of Release: October 23, 2013
Date of Hearing: December 12, 2013

Provisions. A medium-duty vehicle must comply with the emission standards in this subsection (b)(1)(A) throughout its full useful life, of 11 years or 120,000 miles, whichever occurs first.

c. *Production and In-use CO_2 standards.* Each vehicle a manufacturer produces that is subject to the standards of this section has an "in-use" CO_2 standard that is calculated from the test result and that applies for selective enforcement audits and in-use testing. This in-use CO_2 standard for each vehicle is equal to the applicable deteriorated emission level multiplied by 1.10 and rounded to the nearest 0.1 g/mile.

2. *N_2O and CH_4 Emission Standards.* The N_2O emissions for new 2014 and subsequent model medium-duty vehicles shall not exceed 0.05 g/mi, and CH_4 emissions for new 2014 and subsequent model medium-duty vehicles shall not exceed 0.05 g/mi. Alternate standards using CO_2 emission credits may be used and are described in the "California Greenhouse Gas Exhaust Emission Standards and Test Procedures for 2014 and Subsequent Model Heavy-Duty Vehicles," incorporated by reference in section (c).

(B) *Otto-Cycle Fleet-Average Emission Standards.*

1. *CO_2 Fleet-Average Standards.* For each model year, a manufacturer's national fleet-average CO_2 emissions for its Otto-cycle medium-duty vehicles shall not exceed the CO_2 fleet-average standard. The CO_2 fleet-average standard is calculated by a national production-weighted average of target values and rounded to the nearest 0.1 grams per mile, as follows:

$$Fleet\ Average\ Standard = \frac{\sum[Target_i \times Volume_i]}{\sum[Volume_i]}$$

The target values, for each vehicle configuration, are calculated as follows:

$$CO_2\ Target\ \left(\frac{g}{mile}\right) = 0.0440 \times WF + 339$$

where WF is the work factor.

$$WF = 0.75 \times (GVWR - Curb\ Weight + xwd) + 0.25 \times (GCWR - GVWR)$$

Where:
xwd = 500 pounds if the vehicle has four-wheel drive or all-wheel drive; xwd = 0 pounds for all other vehicles.

a. *Phase-In Provisions.* A manufacturer must choose either Option A or Option B below for phasing in the Otto-cycle fleet-average CO_2 target of this subsection (b)(1)(B).

Option A Phase-In Provisions for Otto-Cycle Fleet-Average CO_2 Target	
Vehicle model year	Option A CO_2 target (g/mile)
2014	[0.0482 × (WF)] + 371
2015	[0.0479 × (WF)] + 369
2016	[0.0469 × (WF)] + 362
2017	[0.0460 × (WF)] + 354
2018 and subsequent	[0.0440 × (WF)] + 339
Option B Phase-In Provisions for Otto-Cycle Fleet-Average CO_2 Target	
Vehicle model year	Option B CO_2 target (g/mile)
2014	[0.0482 × (WF)] + 371
2015	[0.0479 × (WF)] + 369
2016–2018	[0.0456 × (WF)] + 352
2019 and subsequent	[0.0440 × (WF)] + 339

b. *Useful Life Provisions.* A medium-duty vehicle must comply with the emission standards in this subsection (b)(1)(B) throughout its full useful life, which is 11 years or 120,000 miles, whichever occurs first.

c. *Production and In-use CO_2 standards.* Each vehicle a manufacturer produces that is subject to the standards of this section has an "in-use" CO_2 standard that is calculated from the test result and that applies for selective enforcement audits and in-use testing. This in-use CO_2 standard for each vehicle is equal to the applicable deteriorated emission level multiplied by 1.10 and rounded to the nearest 0.1 g/mile.

2. *N_2O and CH_4 Emission Standards.* The N_2O emissions for new 2014 and subsequent model medium-duty vehicles shall not exceed 0.05 g/mi, and CH_4 emissions for new 2014 and subsequent model medium-duty vehicles shall not exceed 0.05 g/mi. Alternate standards using CO_2 emission credits may be used and are described in the applicable test procedures incorporated by reference in section (c).

(C) *Air Conditioning Leakage.* Loss of refrigerant from air conditioning

systems from 2014 and later medium-duty vehicles may not exceed 1.50 percent per year, except as allowed by subsections (b)(1)(C)(1) and (b)(1)(C)(2) below.

1. For air condition refrigerants other than HFC–134a, the leakage rate is adjusted by multiplying it by the global warming potential of the refrigerant and dividing the product by 1430 (which is the global warming potential of HFC–134a).
2. If the total refrigerant capacity is less than 734 grams, the leakage rate may exceed 1.50 percent, as long as the total leakage rate does not exceed 11.0 grams per year.

(c) The test procedures for determining compliance with GHG emission standards applicable to 2014 and subsequent model medium- and heavy-duty vehicles are set forth in the "California Greenhouse Gas Exhaust Emission Standards and Test Procedures for 2014 and Subsequent Model Heavy-Duty Vehicles," adopted [INSERT DATE OF ADOPTION], which is incorporated by reference herein.

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39010, 39600, 39601, 43013, 43018, 43101, 43104, and 43105, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 38580, 39002, 39003, 39600, 39601, 43000, 43009.5, 43013, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43205, 43205.5, and 43211, Health and Safety Code.

13.) Adopt new section 95664, title 17, CCR, to read as follows:

(Note: The entire text of section 95664 set forth below is new language proposed to be added to the CCR.)

§95664. Severability.

If any section, paragraph, subparagraph, sentence, clause, phrase, or portion of the subarticle is, for any reason, held invalid, unconstitutional, or unenforceable by any court of competent jurisdiction, such portion shall be deemed as a separate, distinct, and independent provision, and such holding shall not affect the validity of the remaining portions of this subarticle.

NOTE: Authority cited: Sections 38501, 38505, 38510, 38560, 39010, 39600, 39601, 43013, 43018, 43101, 43104, and 43105, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38560, 38580, 39002; 39003, 39600, 39601, 43000, 43009.5, 43013, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43205, 43205.5, and 43211, Health and Safety Code.

APPENDIX I-A-1

State of California
AIR RESOURCES BOARD

PROPOSED
PHASE I GREENHOUSE GAS REGULATION AMENDMENTS TO

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2004 AND SUBSEQUENT MODEL HEAVY-DUTY DIESEL-ENGINES AND VEHICLES

Adopted:	December 12, 2002
Amended:	July 24, 2003
Amended:	September 1, 2006
Amended:	July 26, 2007
Amended:	October 17, 2007
Amended:	October 14, 2008
Amended:	September 27, 2010
Amended:	October 12, 2011
Amended:	March 22, 2012
Amended:	December 6, 2012
Amended:	April 18, 2013 (Corrected by Section 100)
Amended:	[INSERT AMENDMENT DATE]

Note: The proposed amendments to this document are shown in underline to indicate additions and strikeout to indicate deletions compared to the test procedures as adopted April 18, 2013. [No change] indicates proposed federal provisions that are also proposed for incorporation herein without change. Existing intervening text that is not amended in this rulemaking is indicated by "* * * *".

Date of Release: October 23, 2013
Date of Hearing: December 12, 2013

NOTE: This document is incorporated by reference in section 1956.8, title 13, California Code of Regulations (CCR). It contains the majority of the requirements necessary for the certification of a heavy-duty engine or heavy-duty vehicle for sale in California. However, reference is made in these test procedures to other ARB documents that contain additional requirements necessary for certification. Note that this list of documents is not inclusive of all necessary requirements to complete an application for certification. The following documents are designed to be used in conjunction with this document. They include:

1. "California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," as last amended December 6, 2012 (incorporated by reference in sections 1960.1(k) and 1961(d), title 13, CCR);

2. "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," as last amended April 18, 2013 (incorporated by reference in section 1961.2 (d), title 13, CCR);

3. "California Evaporate Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles," as last amended December 6, 2012 (incorporated by reference in section 1976(c), title 13, CCR)

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2004 AND SUBSEQUENT MODEL HEAVY-DUTY DIESEL ENGINES AND VEHICLES

The following provisions of Subparts A, I, N, S, and T, Part 86, of Subparts A through I, Part 1036, and of Subparts A through K, Part 1065, Title 40, Code of Federal Regulations, as adopted or amended by the U.S. Environmental Protection Agency on the date set forth next to the applicable section listed below, and only to the extent they pertain to the testing and compliance of exhaust emissions from heavy-duty diesel engines and vehicles, are adopted and incorporated herein by this reference as the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," except as altered or replaced by the provisions set forth below.

PART 86 – CONTROL OF EMISSIONS FROM NEW AND IN-USE HIGHWAY VEHICLES AND ENGINES

I. GENERAL PROVISIONS FOR CERTIFICATION AND IN-USE VERIFICATION OF EMISSIONS.

§86.1 Reference materials. ~~June 14, 2005~~ November 14, 2011.

1 Delete subparagraph (a).

2 Amend subparagraph (b) as follows:

2.1 Delete subparagraphs (b)(1) through (b)(5).

2.2 Subparagraph (b)(6) [No change.]

Subpart A - General Provisions for Emission Regulations for 1977 and Later Model Year New Light-Duty Vehicles, Light-Duty Trucks, and Heavy-Duty Engines, and for 1985 and Later Model Year New Gasoline-Fueled, Natural Gas-Fueled, Liquefied Petroleum Gas-Fueled and Methanol-Fueled Heavy-Duty Vehicles.

1. General Applicability. [§86.xxx-1]

A. Federal Provisions.

1. **§86.001-1** October 6, 2000.

1.1 Subparagraph (a) [No change.]

1.2 Subparagraph (b) *Optional Applicability.* [No change.]

1.3 Subparagraphs (c) and (d) Reserved

1.4 Amend subparagraph (e) as follows: *Small volume manufacturers.* Special certification procedures are available for any manufacturer whose projected or actual combined California sales of passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles and heavy-duty engines in its product line (including all vehicles and engines imported under the

provisions of 40 CFR §§85.1505 and 85.1509 of this chapter) are fewer than 4,500 units based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification. For a manufacturer certifying for the first time in California, model year production shall be based on projected California sales. To certify its product line under these optional procedures, the small-volume manufacturer must first obtain the Executive Officer's approval. The manufacturer must meet the eligibility criteria specified in 40 CFR §86.092-14(b) before the Executive Officer's approval will be granted. The small volume manufacturer's heavy-duty engine certification procedures are described in 40 CFR §86.092-14.

1.5 Subparagraph (f) *Optional procedures for determining exhaust opacity.* [No change.]

2. **§86.005-1** October 6, 2000

2.1 Subparagraph (a) [No change.]

2.2 Subparagraph (b) *Optional Applicability.* [No change.]

2.3 Subparagraph (c) [n/a; Otto-cycle]

2.4 Subparagraph (d) Reserved

2.5 Amend subparagraph (e) as follows: *Small volume manufacturers.* Special certification procedures are available for any manufacturer whose projected or actual combined California sales of passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles and heavy-duty engines in its product line (including all vehicles and engines imported under the provisions of 40 CFR §§85.1505 and 85.1509 of this chapter) are fewer than 4,500 units based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification. For a manufacturer certifying for the first time in California, model year production shall be based on projected California sales. To certify its product line under these optional procedures, the small-volume manufacturer must first obtain the Executive Officer's approval. The manufacturer must meet the eligibility criteria specified in 40 CFR §86.092-14(b) before the Executive Officer's approval will be granted. The small volume manufacturer's heavy-duty engine certification procedures are described in 40 CFR §86.092-14.

2.6 Subparagraph (f) *Optional procedures for determining exhaust opacity.* [No change.]

3. **§86.016-1** November 14, 2011.

3.1 Subparagraph (a) *Applicability.* [No change.]

3.2 Subparagraph (b) *Optional Applicability.* [n/a; Otto-cycle]

3.3 Subparagraph (c) through (c)(1). [No change.]

3.4 Delete subparagraph (c)(2) and replace with the following: On-

board diagnostic requirements according to the provisions of title 13, CCR, sections 1968.2 and 1968.5 or title 13, CCR, sections 1971.1 and 1971.5, as applicable.

3.5 Delete subparagraph (c)(3) and replace with the following: Evaporative emission standards according to the provisions of title 13, CCR, section 1976.

3.6 Delete subparagraph (c)(4) and replace with the following: Refueling emission standards according to the provisions of title 13, CCR, section 1978.

3.7 Subparagraph (d) *Non-petroleum fueled vehicles.* [No change.]

3.8 Amend subparagraph (e) as follows: *Small volume manufacturers.* Special certification procedures are available for any manufacturer whose projected or actual combined California sales of passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles, and heavy-duty engines in its product line (including all vehicles and engines imported under the provisions of 40 CFR §§85.1505 and 85.1509) are fewer than 4,500 units based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification. For a manufacturer certifying for the first time in California, model year production shall be based on projected California sales. To certify its product line under these optional procedures, the small volume manufacturer must first obtain the Executive Officer's approval. The manufacturer must meet the eligibility criteria specified in 40 CFR §86.094-14(b) before the Executive Officer's approval will be granted. The small volume manufacturer's heavy-duty engine certification procedures are described in 40 CFR §86.098-14.

3.9 Subparagraph (f) *Optional procedures for determining exhaust opacity.* [No change.]

B. California provisions.

1. These regulations shall be applicable to all heavy-duty diesel methanol-fueled, ethanol-fueled, natural-gas-fueled and liquefied-petroleum gas-fueled dedicated, dual-fuel and multi-fuel engines (and vehicles) including those engines derived from existing diesel engines. For any engine that is not a distinctly diesel engine nor derived from such, the Executive Officer shall determine whether the engine shall be subject to these regulations or alternatively to the heavy-duty Otto-cycle engine regulations, in consideration of the relative similarity of the engine's torque-speed characteristics and vehicle applications with those of diesel and Otto-cycle engines. Reference to dual fuel vehicles or engines shall also mean bi-fuel vehicles or engines. References to methanol shall also mean ethanol.

2. References in the federal regulations to light-duty vehicles and light-duty trucks do not apply. References to heavy-duty Otto-cycle engines or vehicles do not apply.

3. Any reference to vehicle or engine sales or vehicle or engine production volume throughout the United States shall mean vehicle or engine sales or vehicle or engine volume in California. References to small volume manufacturers shall mean California small volume manufacturer as defined in section I.1.A., above.

4. Regulations concerning U.S. EPA hearings, U.S. EPA inspections, specific language on the Certificate of Conformity, non-conformance penalties, selective enforcement audit, evaporative emission, high-altitude vehicles and testing, alternative useful life, and Certification Short Test shall not be applicable to these procedures, except where specifically noted. The regulations pertaining to evaporative emissions are contained in "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles," adopted August 5, 1999, as last amended March 22, 2012, as incorporated in title 13, CCR §1976. All heavy-duty methanol- and gaseous-fueled vehicles shall comply with the evaporative requirements in title 13, CCR, §1976.

2. Definitions. [§86.xxx-2]

A. Federal Provisions.

1. **§86.004-2** January 18, 2001. [All federal definitions apply, except as otherwise noted below. Definitions specific to other requirements are contained in separate documents.]

2. **§86.010-2** April 30, 2010. [All federal definitions apply, except as otherwise noted below. Definitions specific to other requirements are contained in separate documents.]

3. **§86.012-2** November 14, 2011. [All federal definitions apply, except as otherwise noted below. Definitions specific to other requirements are contained in separate documents.]

3.1 Amend paragraph as follows: The definitions of §86.010-2 continue to apply to model year 2010 and later model year engines and vehicles. The definitions listed in this section apply beginning with model year 2012. "GHG Urban Bus" means a passenger-carrying vehicle with a load capacity of fifteen or more passengers and intended primarily for intracity operation, i.e. , within the confines of a city or greater metropolitan area. GHG urban bus operation is characterized by short rides and frequent stops. To facilitate this type of operation, more than one set of quick-operating entrance and exit doors would normally be installed. Since fares are usually paid in cash or tokens, rather than purchased in advance in the form of tickets, GHG urban buses would normally

have equipment installed for collection of fares. GHG urban buses are also typically characterized by the absence of equipment and facilities for long distance travel, e.g., rest rooms, large luggage compartments, and facilities for stowing carry-on luggage.

B. **California Provisions.**

"Administrator" means the Executive Officer of the Air Resources Board.
"Certificate of Conformity" means "Executive Order" certifying vehicles for sale in California.
"Certification" means certification as defined in Section 39018 of the Health and Safety Code.
"**Designated Compliance Officer**" means the Executive Officer of the Air Resources Board or his or her delegate.
"**EPA**" shall also mean Air Resources Board or Executive Officer of the Air Resources Board
"EPA Enforcement Officer" means the Executive Officer or his or her delegate.
"Measurement allowance" means accuracy margin.
"Medium-duty engine" means a heavy-duty engine that is used to propel a medium-duty vehicle.
"Medium-duty vehicle" means 2004 through 2006 model year heavy-duty low-emission vehicle, ultra-low-emission vehicle, super-ultra-low-emission vehicle or zero-emission vehicle certified to the standards in title 13, CCR, section 1960.1(h)(2) having a manufacturer's gross vehicle weight rating of 14,000 pounds or less; and any 2004 and subsequent model heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission vehicle certified to the standards in title 13, CCR section 1956.8(h), having a manufacturer's gross vehicle weight rating between 8,501 and 14,000 pounds.
"NTE standard" means NTE emission limit.
"**Warranty period**" [For guidance see title 13, CCR, §2036].

* * * *

16. Prohibition of defeat devices. [§86.004-16] [July 13, 2005]. [No change.]

17. On-board diagnostics for engines used in applications less than or equal to 14,000 pounds GVWR. [§86.099-17; §86.005-17; §86.007-17]; [Delete replace with: All heavy-duty diesel cycle engines used in vehicles up to 14,000 pounds GVW must have an on-board diagnostic system as required in title 13, CCR §1968 et seq, as applicable.]

18. ~~§86.xxx-18. [Reserved.]~~ On-board diagnostics for engines used in applications greater than 14,000 pounds GVWR. §86.010-18 [Delete replace with: All heavy-duty diesel cycle engines used in vehicles greater than 14,000 pounds GVWR must have an on-board diagnostic system as required in title 13, CCR §1971.1 et seq. as applicable.]

* * * *

23. Required data. [§86.xxx-23]

A. Federal provisions.

1. **§86.098-23**. April 30, 2010.

1.1 Subparagraphs (a) through (b)(1)(i) [No change.]

1.2 Add the following sentence to subparagraph (b)(1)(ii): The data derived from testing to determine the exhaust emission deterioration factors shall be submitted to the Executive Officer for review. If the durability test method is accepted by EPA, it shall also be accepted by ARB, subject to the following condition. If, after certification for the first model year in which the method is used, the Executive Officer determines that a manufacturer's durability test procedures do not conform with good engineering practices, the Executive Officer may require changes to that manufacturer's durability test procedures for subsequent model years. The manufacturer's revised durability test procedures shall be submitted to the Executive Officer for review and approval.

1.3 Subparagraphs (b)(2) through (h)(2) [No change.]

1.4 Amend subparagraph (h)(3) as follows:

(h)(3)(i) These reports shall be submitted within 90 days of the end of the model year to: Chief, Mobile Source Operations Division, California Air Resources Board, ~~9528 Telstar Avenue~~ 9480 Telstar Avenue, Ste. ~~#4~~, El Monte, California 91731.

1.5 Subparagraphs (h)(3)(ii) through (m) [No change.]

2. **§86.001-23.** October 21, 1997. [No change, except that the amendments indicated for §86.098-23 above still apply.]

3. **§86.007-23.** ~~October 30, 2009~~ August 16, 2013. [No change, except that the amendments indicated for §86.098-23 above still apply.]

* * * *

Subpart S – General Compliance Provisions for Control of Air Pollution From New and In-Use Light-Duty Vehicles, Light-Duty Trucks, and Complete Otto-Cycle Heavy-Duty Vehicles.

86.1863-07 Optional chassis certification for diesel vehicles. ~~September 15, 2011~~ November 14, 2011.

1. Amend subparagraph (a) as follows: For the 2004 through 2014 model years, a manufacturer may optionally certify heavy-duty diesel vehicles weighing 14,000 pounds GVWR or less to the emission standards specified in title 13, CCR, §1961. Such vehicles must meet all applicable requirements of the "California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," as amended December 6, 2012, as incorporated by reference in title 13, CCR, §1961(d). For the 2015 through 2019 model years, a manufacturer may optionally certify heavy-duty diesel vehicles weighing 8,500 to 10,000 pounds GVWR or less to the emission standards specified in title 13, CCR, §1961 or §1961.2, as applicable. Such vehicles must meet all applicable requirements of the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," as amended December 6, 2012, incorporated by reference in section 1961.2, title 13, CCR. For the 2015 and subsequent model years, a manufacturer may optionally certify heavy-duty diesel vehicles weighing 10,001 to 14,000 pounds GVWR or less to the emission standards specified in title 13, CCR, §1961.2. Such vehicles must meet all applicable requirements of the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," as amended December 6, 2012, incorporated by reference in section 1961.2, title 13, CCR. For the 2020 and subsequent model years, heavy-duty diesel vehicles 8,501 to 10,000 pounds GVWR must certify to the primary emission standards and test procedures for complete vehicles specified in section 1961.2, title 13, CCR.

2. Amend subparagraph (b) as follows: Diesel vehicles optionally certified under this section are subject to the OBD requirements of title 13, CCR, §1968.2.

3. Subparagraphs (c) to (g). [No change.]

4. Subparagraphs (h) and (i). ~~[n/a]~~ [No change.]

* * * *

PART 1036 – CONTROL OF EMISSIONS FROM NEW AND IN-USE HEAVY-DUTY HIGHWAY ENGINES

Subpart A – Overview and Applicability

1036.1 Does this part apply for my engines? November 14, 2011.
1036.2 Who is responsible for compliance? November 14, 2011.
1036.5 Which engines are excluded from this part's requirements? August 16, 2013.
1036.10 How is this part organized? November 14, 2011.
1036.15 Do any other regulation parts apply to me? November 14, 2011.
1036.30 Submission of information. November 14, 2011.

1. Amend subparagraph as follows: Send all reports and requests for approval to the ARB Designated Compliance Officer, as follows: Chief, Mobile Source Operations Division, Air Resources Board, 9480 Telstar Avenue, Ste. #4, El Monte, CA 91731.

Subpart B – Emission Standards and Related Requirements

1036.100 Overview of exhaust emission standards. November 14, 2011.
1036.108 Greenhouse gas emission standards. November 14, 2011.

1. Add the following section to the introductory paragraph: Optional Compliance Via the 2014 MY National Heavy-Duty Engine and Vehicle Greenhouse Gas Program. For the 2014 through 2022 model years, a manufacturer may elect to demonstrate compliance with this section, §1036.108, for all of its applicable heavy-duty engines by demonstrating compliance with the 2014 MY National Heavy-Duty Engine and Vehicle Greenhouse Gas Program, if it meets the criteria identified below.

(1) A manufacturer that selects compliance with this option must notify the Executive Officer of that selection, in writing, prior to the start of the applicable model year or December 1, 2014, whichever is later;

(2) The manufacturer must submit to ARB all data that it submitted to U.S. Environmental Protection Agency in accordance with the reporting requirements as required under 40 CFR §1036.205, §1036.250, and §1036.730, for demonstrating compliance with the 2014 MY National Heavy-Duty Engine and Vehicle Greenhouse Gas Program and the U.S. Environmental Protection Agency determination of compliance. With the exception of the 2014 model year, all such data must be submitted within 30 days of receipt of the U.S. Environmental Protection Agency Certificate of Conformity or of the date of submission to the U.S. Environmental Protection Agency, whichever is later, for each model year that a manufacturer selects compliance with this option;

(3) The manufacturer must provide to the Executive Officer separate numbers for each engine family of heavy-duty engines produced and delivered for sale in California each model year and all values used in calculating positive or negative

emission credits in §1036.730.

2. Subparagraphs (a) through (f). [No change.]

1036.115 Other requirements. November 14, 2011.

1036.130 Installation instructions for vehicle manufacturers. November 14, 2011.

1. Subparagraphs (a) through (b)(1). [No change.]

2. Delete and replace subparagraph (b)(2), as follows: State "Failing to follow these instructions when installing a certified engine in a heavy-duty motor vehicle violates federal and state law, subject to fines or other penalties as described in the Clean Air Act and California Health and Safety Code."

3. Subparagraphs (b)(3) through (d). [No change.]

1036.135 Labeling. November 14, 2011.

1. Amend the introductory paragraph as follows: Label your engines as described in 40 CFR §86.007-35(a)(3), as modified by these test procedures, with the following additional information:

2. Subparagraph (b) through (d). [No change.]

1036.140 Primary intended service class. November 14, 2011.

1036.150 Interim provisions. August 16, 2013.

1. Amend subparagraph (a) as follows: *Credit provisions for 2013 model year compliance*. The provisions of this paragraph (a) apply to 2013 model year heavy-duty diesel engines that have generated early credits with U.S. Environmental Protection Agency. For each 2013 model year heavy-duty diesel engine that is certified to the greenhouse gas standards of 40 CFR Part 1036, an equal amount of credit as given by the U.S. Environmental Protection Agency will be granted in the California ABT Program. The manufacturer must notify ARB of its intent to use this provision before submitting its application and must submit to ARB all data that the manufacturer submitted to U.S. Environmental Protection Agency in accordance with the reporting requirements as required under 40 CFR §§1036.205, 1036.250, and 1036.730.

2. Subparagraphs (a)(1) through (i). [No change.]

Subpart C – Certifying Engine Families

1036.205 What must I include in my application? August 16, 2013.
1036.210 Preliminary approval before certification. November 14, 2011.
1036.225 Amending my application for certification. August 16, 2013.
1036.230 Selecting engine families. November 14, 2011.
1036.235 Testing requirements for certification. November 14, 2011.
1036.241 Demonstrating compliance with greenhouse gas pollutant standards. November 14, 2011.
1036.250 Reporting and recordkeeping for certification. November 14, 2011.
1036.255 What decisions may EPA make regarding my certificate of conformity?

November 14, 2011.

Subpart D – [Reserved]

Subpart E – In-use Testing

1036.401 In-use testing. November 14, 2011.

Subpart F – Test Procedures

1036.501 How do I run a valid emission test? November 14, 2011.
1036.525 Hybrid engines. August 16, 2013.
1036.530 Calculating greenhouse gas emission rates. November 14, 2011.

Subpart G – Special Compliance Provisions

1036.601 What compliance provisions apply to these engines? November 14, 2011.
1036.610 Innovative technology credits and adjustments for reducing greenhouse gas emissions. November 14, 2011.

1. Subparagraphs (a) through (c). [No change.]
2. Amend subparagraph (d) as follows: We may seek public comment on your request. However, we will generally not seek public comment on credits/adjustments based on A to B engine dynamometer testing, chassis testing, or in-use testing.

1036.615 Engines with Rankine cycle waste heat recovery and hybrid powertrains. August 16, 2013.
1036.620 Alternate CO_2 standards based on model year 2011 compression-ignition engines. November 14, 2011.
1036.625 In-use compliance with family emission limits (FELs). November 14, 2011.

Subpart H – Averaging, Banking, and Trading for Certification

1036.701 General provisions. November 14, 2011.
1036.705 Generating and calculating emission credits. November 14, 2011.
1036.710 Averaging. November 14, 2011.
1036.715 Banking. November 14, 2011.
1036.720 Trading. November 14, 2011.
1036.725 What must I include in my application for certification? November 14, 2011.
1036.730 ABT reports. November 14, 2011.
1036.735 Recordkeeping. November 14, 2011.

1036.740 Restrictions for using emission credits. November 14, 2011.
1036.745 End-of-year CO_2 credit deficits. November 14, 2011.
1036.750 What can happen if I do not comply with the provisions of this subpart? November 14, 2011.

Subpart I – Definitions and Other Reference Information

1036.801 Definitions. August 16, 2013.

A. Federal Provisions. [All federal definitions apply, except as otherwise noted below.]

B. California Provisions.
"2014 MY National Heavy-Duty Engine and Vehicle Greenhouse Gas Program" means the national program that applies to new 2014 and subsequent model medium- and heavy-duty engines and vehicles to control greenhouse gas emissions, as adopted by the U.S. Environmental Protection Agency (76 Fed. Reg. 57106 (November 14, 2011)), and as subsequently amended on August 16, 2013, as incorporated in and amended by these test procedures.
"Certificate of Conformity" means an Executive Order certifying vehicles for sale in California.
"Certification" means relating to the process of obtaining an Executive Order for an engine family that complies with the emission standards and requirements in this part.
"Designated Compliance Officer" means the Executive Officer of the Air Resources Board or a designee of the Executive Officer.
"Designated Enforcement Officer" means the Executive Officer of the Air Resources Board or a designee of the Executive Officer.
"EPA" shall also mean Air Resources Board or Executive Officer of the Air Resources Board.
"Manufacturer" means any person who manufacturers an engine, vehicle, or piece of equipment for sale in California or otherwise introduces a new engine into commerce in California. This includes importers who import engines or vehicles for resale.
"U.S. Environmental Protection Agency" means the United States Environmental Protection Agency.
"We (us, our)" means the Executive Officer and any authorized representatives.

1036.805 Symbols, acronyms, and abbreviations. November 14, 2011.
1036.810 Incorporation by reference. November 14, 2011.
1036.815 Confidential information. November 14, 2011.

A. Federal Provisions. [No change.]

B. California Provisions. The provisions of title 17, CCR section 91000 through 91022 apply for information you consider confidential. Note that according to section 91011, emissions data shall not be identified as confidential.

1036.820 Requesting a hearing. November 14, 2011.

1. Delete subparagraph (a) and replace as follows: You may request a hearing under certain circumstances, as described elsewhere in this part.

2. Subparagraph (b). [No change.]

3. Amend subparagraph (c) as follows: If we agree to hold a hearing, we will use the procedures specified in 17 CCR sections 60055.1 through 6055.43.

1036.825 Reporting and recordkeeping requirements. November 14, 2011.

1. Subparagraphs (a) through (d). [No change.]

2. Delete subparagraph (e).

PART 1065 – ENGINE-TESTING PROCEDURES.

Subpart A – Applicability and General Provisions

1065.1 Applicability. ~~September 15, 2011~~ November 14, 2011.

1. Amend subparagraph (a) as follows:

1.1. Introductory paragraph. [No change.]

1.2. Subparagraphs (a)(1). [n/a]

1.3. Amend subparagraph (a)(2) as follows: Model year 2010 and later heavy-duty highway engines we regulate under title 13, CCR, §1956.8. For earlier model years, manufacturers may use the test procedures in this part or those specified in 40 CFR part 86, subpart N, according to §1065.10, as modified by these test procedures.

1.4. Subparagraphs (a)(3) through (a)(8). [n/a]

2. Subparagraph (b). [n/a]

3. Subparagraph (c) through (~~g~~ h). [No change.]

1065.2 Submitting information to EPA under this part. April 30, 2010.

1. Subparagraphs (a) through (d). [No change.]

2. Amend subparagraph (e) as follows: See title 1~~3~~7, CCR, section 91011 for provisions related to confidential information. Note that according to this section, emission data shall not be identified as confidential.

3. Subparagraph (f). [No change.]

1065.5 Overview of this part 1065 and its relationship to the standard-setting part. October 30, 2009.

1065.10 Other procedures. April 30, 2010.

1065.12 Approval of alternate procedures. June 30, 2008.

1065.15 Overview of procedures for laboratory and field testing. ~~September 15, 2011~~ November 14, 2011.

1065.20 Units of measure and overview of calculations. ~~September 15, 2011~~ November 14, 2011.

1065.25 Recordkeeping. July 13, 2005.

Subpart B – Equipment Specifications.

1065.101 Overview. June 30, 2008.

1065.110 Work inputs and outputs, accessory work, and operator demand. June 30, 2008.

1065.120 Fuel properties and fuel temperature and pressure. June 30, 2008.

1065.122 Engine cooling and lubrication. June 30, 2008.

1065.125 Engine intake air. ~~September 15, 2011~~ November 14, 2011.

1065.127 Exhaust gas recirculation. July 13, 2005.

1065.130 Engine exhaust. June 30, 2008.
1065.140 Dilution for gaseous and PM constituents. ~~September 15, 2011~~ November 14, 2011.
1065.145 Gaseous and PM probes, transfer lines, and sampling system components. April 30, 2010.
1065.150 Continuous sampling. July 13, 2005.
1065.170 Batch sampling for gaseous and PM constituents. ~~September 15, 2011~~ November 14, 2011.
1065.190 PM-stabilization and weighing environments for gravimetric analysis. ~~September 15, 2011~~ November 14, 2011.
1065.195 PM-stabilization environment for in-situ analyzers. June 30, 2008.

Subpart C – Measurement Instruments

1065.201 Overview and general provisions. April 30, 2010.
1065.202 Data updating, recording, and control. July 13, 2005.
1065.205 Performance specifications for measurement instruments. ~~September 15, 2011~~ November 14, 2011.

Measurement of Engine Parameters and Ambient Conditions

1065.210 Work input and output sensors. June 30, 2008.
1065.215 Pressure transducers, temperature sensors, and dewpoint sensors. June 30, 2008.

Flow-Related Measurements

1065.220 Fuel flow meter. ~~June 30, 2008~~ November 14, 2011.
1065.225 Intake-air flow meter. ~~September 15, 2011~~ November 14, 2011.
1065.230 Raw exhaust flow meter. July 13, 2005.
1065.240 Dilution air and diluted exhaust flow meters. April 30, 2010.
1065.245 Sample flow meter for batch sampling. July 13, 2005.
1065.248 Gas divider. July 13, 2005.

CO and CO_2 Measurements

1065.250 Nondispersive infra-red analyzer. ~~September 15, 2011~~ November 14, 2011.

Hydrocarbon Measurements

1065.260	Flame ionization detector. ~~September 15, 2011~~ November 14, 2011.
1065.265	Nonmethane cutter. ~~September 15, 2011~~ November 14, 2011.
1065.267	Gas chromatograph. ~~September 15, 2011~~ November 14, 2011.

NOx Measurements

1065.270	Chemiluminescent detector. ~~September 15, 2011~~ November 14, 2011.
1065.272	Nondispersive ultraviolet analyzer. ~~September 15, 2011~~ November 14, 2011.
1065.275	N_2O measurement devices. ~~September 15, 2011.~~ August 16, 2013.

* * * *

Subpart G – Calculations and Data Requirements.

1065.601	Overview. April 30, 2010.
1065.602	Statistics. ~~September 15, 2011~~. November 14, 2011.
1065.610	Duty cycle generation. ~~September 15, 2011.~~ August 16, 2013.

* * * *

APPENDIX I-A-2

State of California
AIR RESOURCES BOARD

PROPOSED
PHASE I GREENHOUSE GAS REGULATION AMENDMENTS TO

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2004 AND SUBSEQUENT MODEL HEAVY-DUTY OTTO-CYCLE ENGINES AND VEHICLES

Adopted:	December 27, 2000
Amended:	December 12, 2002
Amended:	July 26, 2007
Amended:	October 17, 2007
Amended:	September 27, 2010
Amended:	March 22, 2012
Amended:	December 6, 2012
Amended:	April 18, 2013 (Corrected by Section 100)
Amended:	[INSERT AMENDMENT DATE]

Note: The proposed amendments to this document are shown in underline to indicate additions and strikeout to indicate deletions compared to the test procedures as adopted April 18, 2013. [No change] indicates proposed federal provisions that are also proposed for incorporation herein without change. Existing intervening text that is not amended in this rulemaking is indicated by "* * * *".

Date of Release: October 23, 2013
Date of Hearing: December 12, 2013

NOTE: This document is incorporated by reference in section 1956.8, title 13, California Code of Regulations (CCR). It contains the majority of the requirements necessary for the certification of a heavy-duty engine or heavy-duty vehicle for sale in California. However, reference is made in these test procedures to other ARB documents that contain additional requirements necessary for certification. Note that this list of documents is not inclusive of all necessary requirements to complete an application for certification. The following documents are designed to be used in conjunction with this document. They include:

1. "California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," as last amended December 6, 2012 (incorporated by reference in sections 1960.1(k) and 1961(d), title 13, CCR);

2. "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," as last amended April 18, 2013 (incorporated by reference in section 1961.2 (d), title 13, CCR);

3. "California Evaporate Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles," as last amended December 6, 2012 (incorporated by reference in section 1976(c), title 13, CCR)

Date of Release: October 23, 2013
Date of Hearing: December 12, 2013

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2004 AND SUBSEQUENT MODEL HEAVY-DUTY OTTO-CYCLE ENGINES

The following provisions of Subparts A, N, and P, Part 86, of Subparts A through I, Part 1036, and of Subparts A through K, Part 1065, Title 40, Code of Federal Regulations ("CFR"), as adopted or amended by the U.S. Environmental Protection Agency on the date set forth next to the 40 CFR Part 86 section listed below, and only to the extent they pertain to the testing and compliance of exhaust emissions from heavy-duty Otto-cycle engines, are adopted and incorporated herein by this reference as the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines," with the following exceptions and additions.

Part I. GENERAL PROVISIONS FOR CERTIFICATION AND IN-USE VERIFICATION OF EMISSIONS

Subpart A - General Provisions for Emission Regulations for 1977 and Later Model Year New Light-Duty Vehicles, Light-Duty Trucks and Heavy-Duty Engines, and for 1985 and Later Model Year New Gasoline-Fueled, Natural Gas-Fueled, Liquefied Petroleum Gas-Fueled and Methanol-Fueled Heavy Duty Vehicles

1. **General Applicability.** [§86.xxx-1]

A. Federal provisions.

1. §86.001-1. October 6, 2000.

1.1 Subparagraph (a). [No change.]

1.2 Delete subparagraph (b) and replace with the following: A manufacturer must certify any complete heavy-duty vehicle of 14,000 pounds gross vehicle weight rating or less in accordance with the medium-duty vehicle provisions contained in the "California Exhaust Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," incorporated herein by reference. Heavy-duty engine or vehicle provisions of subpart A do not apply to such a vehicle.

1.3 Subparagraph (c). [n/a (ADP for LDVs)]

1.4 Subparagraph (d). [n/a (NLEVs)]

1.5 Amend subparagraph (e) as follows: *Small volume manufacturers.* Special certification procedures are available for any manufacturer whose projected or actual combined California sales of passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles and heavy-duty engines in its product line are fewer than 4,500 units based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification. For a manufacturer certifying for the first time in California, model-year production shall be based on projected California sales. The small volume manufacturer's heavy-duty engine certification procedures are described in 40 CFR §86.092-14.

1.6 Subparagraph (f). [n/a; exhaust opacity refers to diesel engines.]

2. §86.005-1 October 6, 2000.

2.1 Subparagraph (a). [No change.]

2.2 Delete subparagraph (b) and replace with the following: A manufacturer must certify any complete heavy-duty vehicle of 14,000 pounds gross vehicle weight rating or less and any 2020 and subsequent model incomplete heavy-duty vehicle of 10,000 pounds gross vehicle weight rating or less in accordance with the medium-duty vehicle provisions contained in the "California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," incorporated by reference in §1961(d), title 13, CCR or the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," incorporated by reference in section 1961.2, title 13, CCR, as applicable. Heavy-duty engine or vehicle provisions of subpart A do not apply to such a vehicle.

2.3 Subparagraph (c). [No change.]

2.4 Subparagraph (d). [Reserved.]

2.5 Amend subparagraph (e) as follows: *Small volume manufacturers.* Special certification procedures are available for any manufacturer whose projected or actual combined California sales of passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles and heavy-duty engines in its product line are fewer than 4,500 units based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification. For a manufacturer certifying for the first time in California, model-year production shall be based on projected California sales. The small volume manufacturer's heavy-duty engine certification procedures are described in 40 CFR §86.092-14.

2.6 Subparagraph (f). [n/a; exhaust opacity refers to diesel engines.]

3. §86.016-1 November 14, 2011.

3.1 Subparagraph (a). *Applicability.* [No change.]

3.2 Delete subparagraph (b) and replace with the following: A manufacturer must certify any complete heavy-duty vehicle of 14,000 pounds gross vehicle weight rating or less and any 2020 and subsequent model incomplete heavy-duty vehicle of 10,000 pounds gross vehicle weight rating or less in accordance with the medium-duty vehicle provisions contained in the "California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," as amended December 6, 2012, incorporated by reference in §1961(d), title 13, CCR or the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks

and Medium-Duty Vehicles," as amended December 6, 2012, incorporated by reference in section 1961.2, title 13, CCR, as applicable. Heavy-duty engine or vehicle provisions of subpart A do not apply to such a vehicle.

3.3 Subparagraph (c) through (c)(1). [No change.]

3.4 Delete subparagraph (c)(2) and replace with the following: On-board diagnostic requirements according to the provisions of title 13, CCR, sections 1968.2 and 1968.5 or title 13, CCR, sections 1971.1 and 1971.5, as applicable.

3.5 Delete subparagraph (c)(3) and replace with the following: Evaporative emission standards according to the provisions of title 13, CCR, section 1976.

3.6 Delete subparagraph (c)(4) and replace with the following: Refueling emission standards according to the provisions of title 13, CCR, section 1978.

3.7 Subparagraph (d). *Non-petroleum fueled vehicles.* [No change.]

3.8 Amend subparagraph (e) as follows: *Small volume manufacturers.* Special certification procedures are available for any manufacturer whose projected or actual combined California sales of passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles and heavy-duty engines in its product line are fewer than 4,500 units based on the average number of vehicles sold for the three previous consecutive model years for which a manufacturer seeks certification. For a manufacturer certifying for the first time in California, model-year production shall be based on projected California sales. To certify its product line under these optional procedures, the small volume manufacturer must first obtain the Executive Officer's approval. The manufacturer must meet the eligibility criteria specified in 40 CFR §86.094-14(b) before the Executive Officer's approval will be granted. The small volume manufacturer's heavy-duty engine certification procedures are described in 40 CFR §86.098-14.

3.9 Subparagraph (f). [n/a; exhaust opacity refers to diesel engines.]

B. California provisions.

1. These regulations are applicable to all heavy-duty Otto-cycle methanol-fueled, ethanol-fueled, natural-gas-fueled and liquefied-petroleum-gas-fueled dedicated, dual-fuel and multi-fuel engines (and vehicles) except those engines derived from existing diesel engines. For any engine which is not a distinctly Otto-cycle engine nor derived from such, the Executive Officer shall determine whether the engine shall be subject to these regulations or alternatively to the heavy-duty diesel engine regulations, in consideration of the relative similarity of the engine's torque-speed characteristics and vehicle applications with those of Otto-cycle and diesel engines. Reference to dual-fuel vehicles or engines shall also mean bi-fuel vehicles or engines.

2. References in the federal regulations to light-duty vehicles and light-duty trucks do not apply.

3. Any reference to vehicle or engine sales throughout the United States shall mean vehicles and engines sales in California. Any reference to small

volume manufacturer shall mean a California small-volume manufacturer as defined in section I.1.A., above.

4. Regulations concerning U.S. EPA hearings, U.S. EPA inspections, specific language on the Certificate of Conformity, evaporative emissions, high-altitude vehicles and testing, particulate and oxides of nitrogen averaging and test group standards applicable in such averaging, alternative useful life, selective enforcement audit, and Certification Short Test shall not be applicable to these procedures, except where specifically noted. The regulations pertaining to evaporative emissions are contained in "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles," as incorporated in §1976, title 13, CCR.

2. **Definitions.** [§86.xxx-2]

A. Federal provisions.

All of the definitions in previous CFR sections continue to apply, except as otherwise noted below. Definitions specific to other requirements such as evaporative emissions are contained in those separate documents.

1. §86.004-2. January 18, 2001.
2. §86.010-2. February 24, 2009.
3. §86.012-2. November 14, 2011.

3.1 Amend paragraph as follows: The definitions of §86.010-2 continue to apply to model year 2010 and later model year engines and vehicles. The definitions listed in this section apply beginning with model year 2012. "GHG Urban Bus" means a passenger-carrying vehicle with a load capacity of fifteen or more passengers and intended primarily for intracity operation, i.e. , within the confines of a city or greater metropolitan area. GHG urban bus operation is characterized by short rides and frequent stops. To facilitate this type of operation, more than one set of quick-operating entrance and exit doors would normally be installed. Since fares are usually paid in cash or tokens, rather than purchased in advance in the form of tickets, GHG urban buses would normally have equipment installed for collection of fares. GHG urban buses are also typically characterized by the absence of equipment and facilities for long distance travel, e.g., rest rooms, large luggage compartments, and facilities for stowing carry-on luggage.

B. California provisions.

"**Administrator**" means the Executive Officer of the Air Resources Board.

"**Certificate of Conformity**" means "Executive Order" certifying vehicles for sale in California.

"**Certification**" means certification as defined in Section 39018 of the Health and Safety Code.

"**Designated Compliance Officer**" means the Executive Officer of the Air Resources Board or his or her delegate.

"EPA" means "Air Resources Board" or the Executive Officer of the Air Resources Board.

"**EPA Enforcement Officer**" means the Executive Officer of the Air Resources Board or his or her delegate.

"Medium-Duty Engine" means a heavy-duty engine that is used in a medium-duty vehicle.

"Medium-Duty Vehicle" means any 1992 through 2006 model-year heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission vehicle certified to the standards in section 1960.1(h)(2) having a manufacturer's gross vehicle weight rating of 14,000 pounds or less and any 2000 and subsequent model heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission vehicle certified to the standards in section 1961(a)(1), 1961.2, or 1962 having a manufacturer's gross vehicle weight rating between 8,500 and 14,000 pounds.

"Warranty" means the warranty provisions set forth in title 13, California Code of Regulations §2036.

* * * *

23. **Required data.** [§86.xxx-23]

A. Federal provisions.

1. §86.001-23. October 21, 1997. [No change.]
2. §86.007-23. ~~January 18, 2001.~~ August 16, 2013 [No change.]

* * * *

35. **Labeling.** [§86.xxx-35]

A. Federal provisions.

1. §86.001-35. April 6, 1994.

1.1 Add the following sentence to the introductory paragraph: The labeling requirements of this section shall apply to all new motor vehicle engines certified according to the provisions of California Health and Safety Code Section 43100.

1.2 Subparagraphs (a)(1) through (a)(3)(iii)(G). [No change.]

1.3 Amend subparagraph (a)(3)(iii)(H) as follows: An unconditional statement of compliance with the appropriate model year California regulations; for example, "This engine conforms to California regulations applicable to XXXX model year new heavy-duty Otto-cycle engines." It may also state that the engine conforms to any applicable federal or Canadian emission standards for new heavy-duty Otto-cycle engines.

2. §86.007-35. August 30, 2006. [No change, except as noted above for §86.001-35.]

* * * *

PART 1036 – CONTROL OF EMISSIONS FROM NEW AND IN-USE HEAVY-DUTY HIGHWAY ENGINES

Subpart A – Overview and Applicability

1036.1 Does this part apply for my engines? November 14, 2011.
1036.2 Who is responsible for compliance? November 14, 2011.
1036.5 Which engines are excluded from this part's requirements? August 16, 2013.
1036.10 How is this part organized? November 14, 2011.
1036.15 Do any other regulation parts apply to me? November 14, 2011.
1036.30 Submission of information. November 14, 2011.

1. Amend subparagraph as follows: Send all reports and requests for approval to the ARB Designated Compliance Officer, as follows: Chief, Mobile Source Operations Division, Air Resources Board, 9480 Telstar Avenue, Ste. #4, El Monte, CA 91731.

Subpart B – Emission Standards and Related Requirements

1036.100 Overview of exhaust emission standards. November 14, 2011.
1036.108 Greenhouse gas emission standards. November 14, 2011.

1. Add the following section to the introductory paragraph: Optional Compliance via the 2014 MY National Heavy-Duty Engine and Vehicle Greenhouse Gas Program. For the 2014 through 2022 model years, a manufacturer may elect to demonstrate compliance with this section, §1036.108, for all of its applicable heavy-duty engines by demonstrating compliance with the 2014 MY National Heavy-Duty Engine and Vehicle Greenhouse Gas Program, if it meets the criteria identified below.

(1) A manufacturer that selects compliance with this option must notify the Executive Officer of that selection, in writing, prior to the start of the applicable model year or December 1, 2014, whichever is later;

(2) The manufacturer must submit to ARB all data that it submitted to U.S. Environmental Protection Agency in accordance with the reporting requirements as required under 40 CFR §1036.205, §1036.250, and §1036.730, for demonstrating compliance with the 2014 MY National Heavy-Duty Engine and Vehicle Greenhouse Gas Program and the U.S. Environmental Protection Agency determination of compliance. With the exception of the 2014 model year, all such data must be submitted within 30 days of receipt of the U.S. Environmental Protection Agency Certificate of Conformity or of the date of submission to the U.S. Environmental Protection Agency, whichever is later, for each model year that a manufacturer selects compliance with this option;

(3) The manufacturer must provide to the Executive Officer separate numbers for each engine family of heavy-duty engines produced and delivered for sale in California each model year and all values used in calculating positive or negative emission credits in §1036.730.

1036.115 Other requirements. November 14, 2011.

1036.130 Installation instructions for vehicle manufacturers. November 14, 2011.

1. Subparagraph (a) through (b)(1). [No change.]

2. Delete and replace subparagraph (b)(2), as follows: State "Failing to follow these instructions when installing a certified engine in a heavy-duty motor vehicle violates federal and state law, subject to fines or other penalties as described in the Clean Air Act and California Health and Safety Code."

3. Subparagraph (b)(3) through (d). [No change.]

1036.135 Labeling. November 14, 2011.

1. Amend the introductory paragraph as follows: Label your engines as described in 40 CFR §86.007-35(a)(3), as modified by these test procedures, with the following additional information:

2. Subparagraph (a) through (d). [No change.]

1036.140 Primary intended service class. November 14, 2011.

1036.150 Interim provisions. August 16, 2013.

Subpart C – Certifying Engine Families

1036.205 What must I include in my application? August 16, 2013.

1036.210 Preliminary approval before certification. November 14, 2011.

1036.225 Amending my application for certification. August 16, 2013.

1036.230 Selecting engine families. November 14, 2011.

1036.235 Testing requirements for certification. November 14, 2011.

1036.241 Demonstrating compliance with greenhouse gas pollutant standards. November 14, 2011.

1036.250 Reporting and recordkeeping for certification. November 14, 2011.

1036.255 What decisions may EPA make regarding my certificate of conformity? November 14, 2011.

Subpart D – [Reserved]

Subpart E – In-use Testing

1036.401 In-use testing. November 14, 2011.

Subpart F – Test Procedures

1036.501 How do I run a valid emission test? November 14, 2011.

1036.525 Hybrid engines. August 16, 2013.

1036.530 Calculating greenhouse gas emission rates. November 14, 2011.

Subpart G – Special Compliance Provisions

1036.601 What compliance provisions apply to these engines?

November 14, 2011.

1036.610 Innovative technology credits and adjustments for reducing greenhouse gas emissions. November 14, 2011.

1. Subparagraphs (a) through (c). [No change.]

2. Amend subparagraph (d) as follows: We may seek public comment on your request. However, we will generally not seek public comment on credits/adjustments based on A to B engine dynamometer testing, chassis testing, or in-use testing.

1036.615 Engines with Rankine cycle waste heat recovery and hybrid powertrains. August 16, 2013.

1036.620 Alternate CO_2 standards based on model year 2011 compression-ignition engines. [n/a; diesel]

1036.625 In-use compliance with family emission limits (FELs). November 14, 2011.

Subpart H – Averaging, Banking, and Trading for Certification

1036.701 General provisions. November 14, 2011.

1036.705 Generating and calculating emission credits. November 14, 2011.

1036.710 Averaging. November 14, 2011.

1036.715 Banking. November 14, 2011.

1036.720 Trading. November 14, 2011.

1036.725 What must I include in my application for certification? November 14, 2011.

1036.730 ABT reports. November 14, 2011.

1036.735 Recordkeeping. November 14, 2011.

1036.740 Restrictions for using emission credits. November 14, 2011.

1036.745 End-of-year CO_2 credit deficits. November 14, 2011.

1036.750 What can happen if I do not comply with the provisions of this subpart? November 14, 2011.

Subpart I – Definitions and Other Reference Information

1036.801 Definitions. August 16, 2013.

A. Federal Provisions. [All federal definitions apply, except as otherwise noted below.]

B. California Provisions.

"2014 MY National Heavy-Duty Engine and Vehicle Greenhouse Gas Program" means the national program that applies to new 2014 and subsequent model medium- and heavy-duty engines and vehicles to control greenhouse gas emissions, as adopted by the U.S. Environmental Protection Agency (76 Fed. Reg. 57106 (November 14, 2011)) and as subsequently amended on August 16, 2013, as incorporated in and amended by these test procedures.

"Certificate of Conformity" means an Executive Order certifying vehicles for sale in

California.
"Certification" means relating to the process of obtaining an Executive Order for an engine family that complies with the emission standards and requirements in this part.
"Designated Compliance Officer" means the Executive Officer of the Air Resources Board or a designee of the Executive Officer.
"Designated Enforcement Officer" means the Executive Officer of the Air Resources Board or a designee of the Executive Officer.
"EPA" shall also mean Air Resources Board or Executive Officer of the Air Resources Board.
"Manufacturer" means any person who manufacturers an engine, vehicle, or piece of equipment for sale in California or otherwise introduces a new engine into commerce in California. This includes importers who import engines or vehicles for resale.
"U.S. Environmental Protection Agency" means the United States Environmental Protection Agency.
"We (us, our)" means the Executive Officer and any authorized representatives.

1036.805 Symbols, acronyms, and abbreviations. November 14, 2011.
1036.810 Incorporation by reference. November 14, 2011.
1036.815 Confidential information. November 14, 2011.

A. Federal Provisions. [No change.]

B. California Provisions. The provisions of title 17, CCR section 91000 through 91022 apply for information you consider confidential. Note that according to section 91011, emissions data shall not be identified as confidential.

1036.820 Requesting a hearing. November 14, 2011.1.
1. Delete subparagraph (a) and replace as follows: You may request a hearing under certain circumstances, as described elsewhere in this part.
2. Subparagraph (b). [No change.]
3. Amend subparagraph (c) as follows: If we agree to hold a hearing, we will use the procedures specified in 17 CCR sections 60055.1 through 6055.43.

1036.825 Reporting and recordkeeping requirements. November 14, 2011.
1. Subparagraphs (a) through (d). [No change.]
2. Delete subparagraph (e).

PART 1065 – ENGINE-TESTING PROCEDURES.

Subpart A – Applicability and General Provisions.

1065.1 Applicability. ~~September 15, 2011~~ November 14, 2011.

1. Amend subparagraph (a) as follows:

1.1. Introductory paragraph. [No change.]

1.2. Subparagraphs (a)(1). [n/a]

1.3. Amend subparagraph (a)(2) as follows: Model year 2010 and later heavy-duty highway engines we regulate under title 13, CCR, §1956.8. For earlier model years, manufacturers may use the test procedures in this part or those specified in 40 CFR part 86, subpart N, according to §1065.10, as modified by these test procedures.

1.4. Subparagraphs (a)(3) through (a)(8). [n/a]

2. Subparagraph (b). [n/a]

3. Subparagraph (c) through (~~g~~ h). [No change.]

1065.2 Submitting information to EPA under this part. April 30, 2010.

1. Subparagraphs (a) through (d). [No change.]

2. Amend subparagraph (e) as follows: See title 1~~3~~7, CCR, section 91011 for provisions related to confidential information. Note that according to this section, emission data shall not be identified as confidential.

3. Subparagraph (f). [No change.]

1065.5 Overview of this part 1065 and its relationship to the standard-setting part. October 30, 2009.

1065.10 Other procedures. April 30, 2010.

1065.12 Approval of alternate procedures. June 30, 2008.

1065.15 Overview of procedures for laboratory and field testing. ~~September 15, 2011~~ November 14, 2011.

1065.20 Units of measure and overview of calculations. ~~September 15, 2011~~ November 14, 2011.

1065.25 Recordkeeping. July 13, 2005.

Subpart B – Equipment Specifications.

1065.101 Overview. June 30, 2008.

1065.110 Work inputs and outputs, accessory work, and operator demand. June 30, 2008.

1065.120 Fuel properties and fuel temperature and pressure. June 30, 2008.

1065.122 Engine cooling and lubrication. June 30, 2008.

1065.125 Engine intake air. ~~September 15, 2011~~ November 14, 2011.

1065.127 Exhaust gas recirculation. July 13, 2005.

1065.130 Engine exhaust. June 30, 2008.

1065.140 Dilution for gaseous and PM constituents. ~~September 15, 2011~~ November 14, 2011.

1065.145 Gaseous and PM probes, transfer lines, and sampling system components. April 30, 2010.
1065.150 Continuous sampling. July 13, 2005.
1065.170 Batch sampling for gaseous and PM constituents. ~~September 15, 2011~~ November 14, 2011.
1065.190 PM-stabilization and weighing environments for gravimetric analysis. ~~September 15, 2011~~ November 14, 2011.
1065.195 PM-stabilization environment for in-situ analyzers. June 30, 2008.

Subpart C – Measurement Instruments.

1065.201 Overview and general provisions. April 30, 2010.
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1065.205 Performance specifications for measurement instruments. ~~September 15, 2011~~ November 14, 2011.

Measurement of Engine Parameters and Ambient Conditions

1065.210 Work input and output sensors. June 30, 2008.
1065.215 Pressure transducers, temperature sensors, and dewpoint sensors. June 30, 2008.

Flow-Related Measurements

1065.220 Fuel flow meter. ~~June 30, 2008.~~ November 14, 2011.
1065.225 Intake-air flow meter. ~~September 15, 2011~~ November 14, 2011.
1065.230 Raw exhaust flow meter. July 13, 2005.
1065.240 Dilution air and diluted exhaust flow meters. April 30, 2010.
1065.245 Sample flow meter for batch sampling. July 13, 2005.
1065.248 Gas divider. July 13, 2005.

CO and CO_2 Measurements

1065.250 Nondispersive infra-red analyzer. ~~September 15, 2011~~ November 14, 2011.

Hydrocarbon Measurements

1065.260 Flame ionization detector. ~~September 15, 2011~~ November 14, 2011.
1065.265 Nonmethane cutter. ~~September 15, 2011~~ November 14, 2011.
1065.267 Gas chromatograph. ~~September 15, 2011~~ November 14, 2011.

NOx Measurements

1065.270	Chemiluminescent detector. ~~September 15, 2011~~ November 14, 2011.
1065.272	Nondispersive ultraviolet analyzer. ~~September 15, 2011~~ November 14, 2011.
1065.275	N_2O measurement devices. ~~September 15, 2011.~~ August 16, 2013.

* * * *

Subpart G – Calculations and Data Requirements.

1065.601	Overview. April 30, 2010.
1065.602	Statistics. ~~September 15, 2011~~ November 14, 2011.
1065.610	Duty cycle generation. ~~September 15, 2011.~~ August 16, 2013.

* * * *

APPENDIX I-A-3

State of California
AIR RESOURCES BOARD

PROPOSED
FOR PHASE I GREENHOUSE GAS REGULATION

CALIFORNIA GREENHOUSE GAS EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2014 AND SUBSEQUENT MODEL HEAVY-DUTY VEHICLES

Adopted: [INSERT DATE OF ADOPTION]

Note: The proposed regulatory text is all new language.

Date of Release: October 23, 2013
Date of Hearing: December 12, 2013

NOTE: This document is incorporated by reference in section 95663(c), title 17, California Code of Regulations (CCR). It contains the majority of the requirements necessary for greenhouse gas certification of a heavy-duty vehicle for sale in California. However, reference is made in these test procedures to other ARB documents that contain certification requirements for heavy-duty engines and vehicles. Note that this list of documents is not inclusive of all necessary requirements to complete an application for certification. The following documents are designed to be used in conjunction with this document. They include:

1. "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as last amended [date] (incorporated by reference in sections 1956.8(b), title 13, CCR);

2. "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles," as last amended [date] (incorporated by reference in sections 1956.8(d), title 13, CCR)

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CALIFORNIA GREENHOUSE GAS EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2014 AND SUBSEQUENT MODEL HEAVY-DUTY VEHICLES

The following provisions of Subparts A through I, Part 1037, and Subparts A through H, Part 1066, Title 40, Code of Federal Regulations (CFR), as adopted by the U.S. Environmental Protection Agency on November 14, 2011, or amended by the U.S. Environmental Protection Agency on the subsequent date set forth next to the applicable section listed below, and only to the extent they pertain to the greenhouse gas emission testing and compliance of greenhouse gas exhaust emissions from medium- and heavy-duty vehicles, are adopted and incorporated herein by this reference as the "California Greenhouse Gas Exhaust Emission Standards and Test Procedures for 2014 and Subsequent Model Heavy-Duty Vehicles," except as altered or replaced by the provisions set forth below.

References in these test procedures to specific sections of the CFR maintain the same numbering system employed in the CFR. In cases where the entire CFR section is incorporated by reference with no modifications, the notation "[No change.]" is used. In cases where the federal requirements are modified by California requirements, the notation "Amend (or delete) subparagraph (__) as follows:" is used. If the federal requirement is not applicable, the notation "[n/a]" is used. In cases where there are California only requirements, the additional California requirements are noted in a separate subsection.

PART 1037 – CONTROL OF EMISSIONS FROM NEW HEAVY-DUTY MOTOR VEHICLES

Subpart A – Overview and Applicability

1037.1 Applicability

A. Federal Provisions [No change.]

B. California provisions.

1. These regulations are applicable to all medium- and heavy-duty vehicles that are subject to the Greenhouse Gas Emission Requirements for New 2014 and Subsequent Model Heavy-Duty Vehicles as specified in title 17, California Code of Regulations sections 95660 through 95664.

2. Any reference to vehicle or engine sales or vehicle or engine production volume throughout the United States shall mean vehicle or engine sales or vehicle or engine volume in California, except in Part 1037, Subpart H, Averaging, Banking, and Trading for Certification.

3. Regulations concerning U.S. EPA hearings, U.S. EPA inspections,

specific language on the Certificate of Conformity, and citations to federal penalty provisions in the Code of Federal regulations or the federal Clean Air Act shall not be applicable to these procedures, except where specifically noted.

1037.5 Excluded vehicles.
1037.10 How is this part organized?
1037.15 Do any other regulation parts apply to me? August 16, 2013.
1037.30 Submission of information.

Subpart B – Emission Standards and Related Requirements

1037.101 Overview of emission standards for heavy-duty vehicles.

1. Subparagraphs (a) through (b) introductory paragraph. [No change.]
2. Subparagraph (b)(1). [n/a; see "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles" and "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles" for California criteria exhaust emission standards.]
3. Amend subparagraph (b)(2) by adding the following: For the 2014 through 2022 model years, a manufacturer may elect to demonstrate compliance with sections §1037.104 through §1037.115 for its entire applicable vehicle fleet by demonstrating compliance with the 2014 MY National Heavy-Duty Engine and Vehicle Greenhouse Gas Program, if it meets the criteria identified below.

(1) A manufacturer that selects compliance with this option must notify the Executive Officer of that selection, in writing, prior to the start of the applicable model year or December 1, 2014, whichever is later;

(2) The manufacturer must submit to ARB all data that the manufacturer submitted to U.S. Environmental Protection Agency in accordance with the reporting requirements as required under 40 CFR §1037.205, §1037.250 and §1037.730, for demonstrating compliance with the 2014 MY National Heavy-Duty Engine and Vehicle Greenhouse Gas Program and the U.S. Environmental Protection Agency determination of compliance. With the exception of the 2014 model year, all such data must be submitted within 30 days of receipt of the U.S. Environmental Protection Agency Certificate of Conformity or of the date of submission to the U.S. Environmental Protection Agency, whichever is later, for each model year that a manufacturer selects compliance with this option;

(3) The manufacturer must provide to the Executive Officer separate numbers for each subfamily of heavy-duty vehicles produced and delivered for sale in California each model year and all values used in calculating positive or negative emission credits in §1037.730.

4. Subparagraph (b)(3). [No change.]
5. Subparagraph (b)(4). [n/a; see "California Evaporative Emission Standards

and Test Procedures for 2001 and Subsequent Model Motor Vehicles" for California fuel evaporative emission standards.]

6. Subparagraph (c). [No change.]

1037.102 Exhaust emission standards for NO_X, HC, PM, and CO.

1. Amend the introductory paragraph as follows: See the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," and the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles," for the exhaust emission standards for NO_X, HC, PM, and CO that apply for heavy-duty vehicles.

1037.104 Exhaust emission standards for CO_2, CH_4, and N_2O for heavy-duty vehicles at or below 14,000 pounds GVWR. August 16, 2013.
1037.105 Exhaust emission standards for CO_2 for vocational vehicles.
1037.106 Exhaust emission standards for CO_2 for tractors above 26,000 pounds GVWR.
1037.115 Other requirements. August 16, 2013.
1037.120 Emission-related warranty requirements.
1037.125 Maintenance instructions and allowable maintenance.
1037.135 Labeling. August 16, 2013.

1. Subparagraphs (a) through (b)(7). [No change.]

2. Amend subparagraph (b)(8) as follows: State: "THIS VEHICLE COMPLIES WITH CALIFORNIA REGULATIONS FOR [MODEL YEAR] HEAVY–DUTY VEHICLES." It may also state that the vehicle conforms to any other applicable federal or Canadian emission standards for heavy-duty vehicles.

3. Subparagraphs (b)(9) through (e). [No change.]

1037.140 Curb weight and roof height.
1037.150 Interim provisions. August 16, 2013.

1. Amend subparagraph (a) as follows: *Credit provisions for 2013 and earlier model year compliance*. The provisions of this paragraph (a) apply to vehicles produced in the 2013 and earlier model years that have generated early credits with U.S. Environmental Protection Agency. For 2013 model year heavy-duty vehicles (or earlier model years for electric vehicles) that are certified to the greenhouse gas standards of this 40 CFR Part 1037, an equal amount of credit as given by the U.S. Environmental Protection Agency will be granted in the California ABT Program. The manufacturer must notify ARB of its intent to use this provision before submitting its application and must submit to ARB all data that it submitted to U.S. Environmental Protection Agency in accordance with the reporting requirements as required under 40 CFR §§1037.205,1037.250, and 1037.730.

2. Subparagraphs (a)(1) through (m). [No change.]

Subpart C – Certifying Vehicle Families

1037.201 General requirements for obtaining a certificate of conformity. August 16, 2013.
1037.205 What must I include in my application?

1. Subparagraphs (a) through (q). [No change.]
2. Amend subparagraph (r) as follows: Unconditionally certify that all the vehicles in the vehicle family comply with the requirements of this part, other referenced parts of the CFR, and title 17, CCR sections 95660 through 95664.
3. Subparagraphs (s) through (v). [No change.]

1037.210 Preliminary approval before certification.
1037.220 Amending maintenance instructions.
1037.225 Amending applications for certification.
1037.230 Vehicle families, sub-families, and configurations. August 16, 2013.
1037.241 Demonstrating compliance with exhaust emission standards for greenhouse gas pollutants.
1037.250 Reporting and recordkeeping.
1037.255 What decisions may EPA make regarding my certificate of conformity?

Subpart D – [Reserved]

Subpart E – In-use Testing

1037.401 General provisions.

Subpart F – Test and Modeling Procedures

1037.501 General testing and modeling provisions. August 16, 2013.

1. Subparagraphs (a) through (c). [No change.]
2. Amend subparagraph (d) as follows: Use the applicable fuels specified in 40 CFR part 1065, as amended by the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," and "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles," to perform valid tests.
3. Subparagraphs (d)(1) through (g). [No change.]

1037.510 Duty-cycle exhaust testing.
1037.520 Modeling CO_2 emissions to show compliance. August 16, 2013.
1037.521 Aerodynamic measurements.
1037.525 Special procedures for testing hybrid vehicles with power take-off. August 16, 2013.
1037.550 Special procedures for testing post-transmission hybrid systems. August 16, 2013.

Subpart G – Special Compliance Provisions

1037.601 What compliance provisions apply to these vehicles?

1. Subparagraphs (a) through (b). [No change.]
2. Amend subparagraph (c) as follows: The prohibitions of 40 CFR 86.1854 apply for vehicles subject to the requirements of this part. The actions prohibited under this provision include the introduction into commerce in California of a complete or incomplete vehicle subject to the standards of this part where the vehicle is not covered by a valid Executive Order or exemption.
3. Amend subparagraph (d) as follows: Except as specifically allowed by this part, the introduction into commerce in California of a tractor containing an engine not certified for use in tractors; or the introduction into commerce in California of a vocational vehicle containing a light heavy-duty or medium heavy-duty engine not certified for use in vocational vehicles is subject to the penalty provisions set forth in Article 3 (commencing with section 42400) of Chapter 4 of Part 4 of, and Chapter 1.5 (commencing with Section 43025) of Part 5 of, Division 26 of the California Health and Safety Code. This prohibition applies especially to the vehicle manufacturer.
4. Subparagraph (e). [No change.]

1037.610 Vehicles with innovative technologies.

1. Subparagraphs (a) through (d). [No change.]
2. Amend subparagraph (e) as follows: We may seek public comment on your request. However, we will generally not seek public comment on credits or adjustments based on A to B chassis testing performed according to the duty-cycle testing requirements of this part or in-use testing performed according to paragraph (c) of this section.

1037.615 Hybrid vehicles and other advanced technologies. August 16, 2013.
1037.620 Shipment of incomplete vehicles to secondary vehicle manufacturers. August 16, 2013.
1037.630 Special purpose tractors.
1037.631 Exemption for vocational vehicles intended for off-road use.
1037.640 Variable vehicle speed limiters.
1037.645 In-use compliance with family emission limits (FELs).
1037.650 Tire manufacturers.
1037.655 Post-useful life vehicle modifications.
1037.660 Automatic engine shutdown systems. August 16, 2013.
1. Subparagraphs (a) and (b). [No change.]
2. Delete subparagraph (c).
3. Subparagraph (d). [No change.]

A. Federal Provisions [No change.]

B. California Provisions

1. Additional provisions apply for automatic engine shutdown systems to comply with California's Heavy-Duty Diesel Engine Idling Requirements, as contained in section 11.B.6. of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles." However, a manufacturer may choose to comply with California's Heavy-Duty Diesel Engine Idling Requirements via the Optional NOx Idling Emission Standard, as described in subsection 11.B.6.3, in which case the aforementioned additional California provisions for the automatic engine shutdown system would not be necessary for compliance.

Subpart H – Averaging, Banking, and Trading for Certification

1037.701 General provisions.
1037.705 Generating and calculating emission credits.
1037.710 Averaging.
1037.715 Banking.
1037.720 Trading.
1037.725 What must I include in my application for certification?
1037.730 ABT reports.
1037.735 Recordkeeping.
1037.740 Restrictions for using emission credits.
1037.745 End-of-year CO_2 credit deficits. August 16, 2013.
1037.750 What can happen if I do not comply with the provisions of this subpart?

Subpart I – Definitions and Other Reference Information

1037.801 Definitions. August 16, 2013.

A. Federal Provisions. [All federal definitions apply, except as otherwise noted below.]

Amend "Vehicle service class" as follows: "Vehicle service class" means a vehicle's weight class as specified in this definition. Note that, while vehicle service class is similar to primary intended service class for engines, they are not necessarily the same. For example, a medium heavy-duty vehicle may include a light heavy-duty engine. Note also that while spark-ignition engines do not have a primary intended service class, vehicles using spark-ignition engines have a vehicle service class.
(1) Light heavy-duty vehicles are those vehicles with GVWR below 19,500 pounds. Vehicles In this class include heavy-duty pickup trucks and vans, motor homes and other recreational vehicles, and some straight trucks with a single rear axle. Typical applications would include personal transportation, light-load commercial delivery, passenger service, agriculture, and construction.
(2) Medium heavy-duty vehicles are those vehicles with GVWR from 19,500 to 33,000 pounds. Vehicles in this class include school buses, straight trucks with a single rear axle, city tractors, and a variety of special purpose vehicles such as small dump trucks, and refuse trucks. Typical applications would include commercial short haul and intra-city delivery and pickup.
(3) Heavy heavy-duty vehicles are those vehicles with GVWR above 33,000 pounds. Vehicles in this class include tractors, GHG urban buses, and other heavy trucks.

B. California Provisions.
"2014 MY National Heavy-Duty Engine and Vehicle Greenhouse Gas Program" means the national program that applies to new 2014 and subsequent model heavy-duty engines and vehicles, as adopted by the U.S. Environmental Protection Agency (76 Fed. Reg. 57106 (November 14, 2011)) and amended August 16, 2013, as incorporated in and amended by these test procedures.
"Certificate of Conformity" means an Executive Order certifying vehicles for sale in California.
"Certification" means relating to the process of obtaining an Executive Order for an engine family that complies with the emission standards and requirements in this part.
"Designated Compliance Officer" means the Executive Officer of the Air Resources Board or a designee of the Executive Officer.
"Designated Enforcement Officer" means the Executive Officer of the Air Resources Board or a designee of the Executive Officer.
"EPA" shall also mean Air Resources Board or Executive Officer of the Air

Resources Board.
"Manufacturer" means any person who manufacturers an engine, vehicle, or piece of equipment for sale in California or otherwise introduces a new engine into commerce in California. This includes importers who import engines or vehicles for resale.
"Medium-duty engine" means any heavy-duty engine that is used to propel a medium-duty vehicle.
"Medium-duty vehicle" means any heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission vehicle certified to the standards in title 13, CCR section 1956.8(h), having a manufacturer's gross vehicle weight rating between 8,501 and 14,000 pounds.
"U.S. Environmental Protection Agency" means the United States Environmental Protection Agency.
"We (us, our)" means the Executive Officer and any authorized representatives.

1037.805 Symbols, acronyms, and abbreviations. August 16, 2013.
1037.810 Incorporation by reference. August 16, 2013.
1037.815 Confidential information.

1. Delete and replace as follows: The provisions of title 17, CCR section 91000 through 91022 apply for information you consider confidential. Note that according to section 91011, emissions data shall not be identified as confidential.

1037.820 Requesting a hearing.

1. Delete subparagraph (a) and replace as follows: You may request a hearing under certain circumstances, as described elsewhere in this part.
2. Subparagraph (b). [No change.]
3. Amend subparagraph (c) as follows: If we agree to hold a hearing, we will use the procedures specified in 17 CCR sections 60055.1 through 6055.43.

1037.825 Reporting and recordkeeping requirements.

1. Subparagraphs (a) through (d). [No change.]
2. Delete subparagraph (e).

Appendix I to Part 1037—Heavy-duty Transient Chassis Test Cycle

Appendix II to Part 1037—Power Take-Off Test Cycle

Appendix III to Part 1037—Emission Control Identifiers

PART 1066 – VEHICLE TESTING PROCEDURES

Subpart A – Applicability and General Provisions

1066.1 Applicability.
1066.2 Submitting information to EPA under this part.

1. Subparagraph (a). [No change.]
2. Delete subparagraph (b) and replace as follows: In the standard-setting part and in 40 CFR 1068.101, we describe your obligation to report truthful and complete information and the consequences of failing to meet this obligation. This obligation applies whether you submit this information directly to ARB or through someone else.
3. Subparagraphs (c) through (d). [No change.]
4. Amend subparagraph (e) as follows: See the provisions of title 17, CCR sections 91000 through 91022 for provisions related to confidential information. Note however that emission data is generally not eligible for confidential treatment.
5. Amend subparagraph (f) as follows: Nothing in this part should be interpreted to limit our ability to verify that vehicles conform to the regulations.

1066.5 Overview of this part 1066 and its relationship to the standard-setting part.
1066.10 Other procedures.
1066.15 Overview of test procedures.
1066.20 Units of measure and overview of calculations.
1066.25 Recordkeeping.

Subpart B – Equipment, Fuel, and Gas Specifications

1066.101 Overview.

1. Subparagraph (a). [No change.]
2. Amend subparagraph (b) as follows: The provisions of 40 CFR part 1065 specify engine-based procedures for measuring emissions. Except as specified otherwise in this part, the provisions of 40 CFR part 1065, as modified by the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," and "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles," apply for testing required by this part as follows:
3. Subparagraphs (b)(1) through (c). [No change.]

Subpart C – Dynamometer Specifications

1066.201 Dynamometer overview.
1066.210 Dynamometers.
1066.215 Summary of verification and calibration procedures for chassis dynamometers.
1066.220 Linearity verification.
1066.225 Roll runout and diameter verification procedure.
1066.230 Time verification procedure.
1066.235 Speed verification procedure.
1066.240 Torque transducer verification and calibration.
1066.245 Response time verification.
1066.250 Base inertia verification.
1066.255 Parasitic loss verification.
1066.260 Parasitic friction compensation evaluation.
1066.265 Acceleration and deceleration verification.
1066.270 Unloaded coastdown verification.
1066.280 Driver's aid.

Subpart D – Coastdown

1066.301 Overview of coastdown procedures.
1066.310 Coastdown procedures for heavy-duty vehicles. August 16, 2013.

Subpart E – Vehicle Preparation and Running a Test

1066.401 Overview.
1066.407 Vehicle preparation and preconditioning.
1066.410 Dynamometer test procedure.
1066.420 Pre-test verification procedures and pre-test data collection.
1066.425 Engine starting and restarting.
1066.430 Performing emission tests.

Subpart F – Hybrids

1066.501 Overview.

Subpart G – Calculations

1066.601 Overview.
1066.610 Mass-based and molar-based exhaust emission calculations.

Subpart H – Definitions and Other Reference Material

1066.701 Definitions.

A. Federal Provisions. [No change.]

B. California Provisions.

"EPA" shall also mean Air Resources Board or Executive Officer of the Air Resources Board.

1066.705 Symbols, abbreviations, acronyms, and units of measure.

1066.710 Reference materials.

APPENDIX I-B

PROPOSED REGULATION ORDER FOR TRACTOR TRAILER GREENHOUSE GAS AMENDMENTS

Note: Set forth below are the proposed amendments to title 17, California Code of Regulations, subartitle 1, sections 95300, 95301, 95302, 95303, and 95305. Proposed amendments to existing sections are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions. Subsections for which no changes are proposed in this rulemaking are indicated with [No change] or "* * * *".

Subarticle 1: Heavy-Duty Vehicle Greenhouse Gas Emission Reduction Regulation

§95300. Purpose.

The purpose of this subarticle is to reduce greenhouse gas emissions from heavy-duty (HD) tractors and 53-foot or longer box-type semitrailers (trailers) that transport freight on a highway within California by establishing emission standards and other requirements applicable to both new 2011 and subsequent model year HD tractors and trailers and to 2010 and earlier model year HD tractors and trailers. The use of compliant aerodynamic technologies and low-rolling resistance tires will ensure reductions of greenhouse gas emissions from affected HD tractors and trailers by reducing the aerodynamic drag and tire rolling resistance forces acting on such HD tractors and trailers.

NOTE: Authority cited: Sections 39600, 39601, 38510, 38560 and 38560.5, Health and Safety Code. Reference: Sections 39600, 38560, 38560.5 and 38580, Health and Safety Code.

§95301. Applicability.

* * * *

(b) The requirements in this subarticle do not apply to the following ~~vehicles~~trailer types and the tractors that pull them:

(1) drop-frame trailers;

(2) chassis trailers;

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Date of Hearing: December 12, 2013

(3) curtain-side trailers;

(4) livestock trailers;

(5) refuse trailers;

(6) box-type trailers less than 53 feet in length;

(7) emergency vehicles; and

(8) military tactical support vehicles.

* * * *

NOTE: Authority cited: Sections 39600, 39601, 38510, 38560 and 38560.5, Health and Safety Code. Reference: Sections 39600, 38560, 38560.5 and 38580, Health and Safety Code.

§95302. Definitions.

(a) The following definitions apply to this subarticle:

* * * *

(19.1) "*Emission standard*," as it applies to the compliance with the requirements and standards set forth in this section, and the remedies provided for in the Health and Safety Code for noncompliance, relates to the emission characteristics of a motor vehicle or motor vehicle engine and means:

(A) a numerical limit on the amount of a given pollutant that a motor vehicle or motor vehicle engine may emit into the atmosphere; or

(B) a requirement that a motor vehicle or motor vehicle engine be equipped with a certain type of pollution-control device or some other design feature related to the control of emissions.

(19.2) *"Evaporative emission standards"* are a subset of emission standards that refer to the specific motor vehicle fuel evaporative emission standards and test procedures incorporated by reference in title 13, CCR section 1976 to which the engine is certified.

(19.3) *"Exhaust emission standards"* or *"tailpipe emission standards"* are a subset of emission standards that collectively refer to the specific

standards or family certification Level (FCL) and family emission limit (FEL) emission levels to which an engine is certified.

* * * *

(43.1) *"Phase 1 Certified Tractor"* means a tractor that has been certified in accordance with either the Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles, as adopted by the USEPA (76 Fed. Reg. 57106 (September 15, 2011)); or the Greenhouse Gas Emission Requirements for New 2014 and Subsequent Model Heavy-Duty Vehicles, as adopted by the California Air Resources Board, sections 95660 to 95664, Subarticle 12, title 17, California Code of Regulations.

* * * *

(53) *"Sleeper-cab tractor"* means a HD tractor originally manufactured with a tractor body that has a compartment, typically containing a bed, located behind the driving compartment.

* * * *

NOTE: Authority cited: Sections 39600, 39601, 38510, 38560 and 38560.5, Health and Safety Code. Reference: Sections 39600, 38560, 38560.5 and 38580, Health and Safety Code.

§95303. Requirements and Compliance Deadlines.

(a) Tractor Requirements.

(1) Except as provided in section 95305, *Exemptions,* beginning January 1, 2010, no 2011 through 2013~~or subsequent~~ model year sleeper-cab ~~HD~~ tractor pulling a 53-foot or longer box-type trailer shall operate on a highway within California unless such tractor is either:

(A) a U.S. EPA SmartWay Certified Tractor, or

(B) a U.S. EPA SmartWay Certified Tractor that has been modified provided:

1. the modification is necessary for the tractor to perform its designed job function,

2. there is no reasonable alternative to the modification that would involve or require a lesser degree of modifications to the tractor, and

3. the Executive Officer has previously approved the modification.

a. An applicant requesting an exemption pursuant to section 95303(a)(1)(B) must submit information to the Executive Officer that describes the proposed modification(s), the need therefor, and the absence or lack of reasonable alternatives to the modification. Such information includes, without limitation, engineering drawings, blueprints, schematics, scientific or technical articles, contract specifications, etc.

b. The Executive Officer will approve or disapprove a request for an exemption pursuant to section 95303(a)(1)(B) upon information submitted by an applicant as specified in section 95303(a)(1)(B)3.a. and good engineering judgment.

(2) Except as provided in section 95305, *Exemptions*, beginning January 1, 2010, no 2011 through 2013~~or subsequent~~ model year HD tractor, including but not limited to sleeper-cab ~~HD~~ tractors, pulling a 53-foot or longer box-type trailer shall operate on a highway within California unless such tractor's tires are U.S. EPA SmartWay Verified Technologies.

(3) Except as provided in section 95305, *Exemptions*, beginning January 1, 2013, no 2010 or previous model year HD tractor, pulling a 53-foot or longer box-type trailer shall operate on a highway within California unless such tractor's tires are U.S. EPA SmartWay Verified Technologies.

* * * *

NOTE: Authority cited: Sections 39600, 39601, 38510, 38560 and 38560.5, Health and Safety Code. Reference: Sections 39600, 38560, 38560.5 and 38580, Health and Safety Code.

§95305. Exemptions.

(a) *Short-Haul Tractor Exemption Requirements.* ~~To qualify, the following must be met:~~

(1) A short-haul tractor pulling a 53-foot or longer box-type trailer on a California highway is exempt from the requirements of sections 95303(a) (1), 95303(a)(2), and 95303(a)(3), as applicable, if the short-haul tractor

(A) has been registered in accordance with the requirements of section 95306, *Short-Haul Tractor, Local-Haul Tractor, Local-Haul Trailer, and Storage Trailer Registration Requirements,* and

(B) is driven less than 50,000 miles annually, including all miles accrued both inside and outside of California.

* * * *

(9) A 2014 or subsequent model year tractor that meets the requirements of sections 95305(a)(1)(A) and 95305(a)(1)(B) is an exempt short-haul tractor.

(b) *Local-Haul Tractor Exemption Requirements.*

(1) A local-haul tractor pulling a 53-foot or longer box-type trailer is exempt from the requirements of sections 95303(a)(1), but still must comply with the requirements of sections 95303(a)(2) and 95303(a)(3), as applicable, if

(A) the local-haul tractor has been registered in accordance with the requirements of section 95306, *Short-Haul Tractor, Local-Haul Tractor, Local-Haul Trailer, and Storage Trailer Registration Requirements,* and

(B) the tractor-trailer combination is traveling within 100 miles of the local-haul tractor's local-haul base.

* * * *

(8) A 2014 or subsequent model year tractor that meets the requirements of sections 95305(b)(1)(A) and 95305(b)(1)(B) is an exempt local-haul tractor.

* * * *

(d) *Drayage Tractor-Trailer Exemption Requirements.*

(1) A drayage tractor pulling a 53-foot or longer box-type trailer on a California highway within 100 miles of a port or intermodal railyard, and the trailer it pulls, are exempt from sections 95303(a) and 95303(b), as applicable, provided:

(A) the trailer was off-loaded from an ocean-going vessel or rail car at the port or intermodal railyard prior to being pulled by the drayage tractor, and the driver has documentation indicating the port or intermodal railyard of origin; or

(B) the drayage tractor is transporting the trailer to the port or intermodal railyard to be loaded onto an ocean-going vessel or rail car, and the driver has documentation indicating the port or intermodal railyard of destination.

* * * *

(f) *Relocation Pass for Trailers.*

(1) An owner that obtains a Relocation Pass for a registered local-haul trailer or a registered storage trailer may operate that vehicle in accordance with the provisions of sections 95305(f)(1)(A) or 95305(f)(1)(B) for a specified period, as determined by the Executive Officer, not to exceed five consecutive days.

(A) A registered local-haul trailer traveling under a Relocation Pass may transport freight on a California highway further than 100 miles from its local-haul base while en route to a new local-haul base that is located further than 100 miles from its current local-haul base, or en route to an out-of-state location.

(B) A registered storage trailer traveling under a Relocation Pass may transport freight on a California highway while en route to a new storage trailer location, or en route to an out-of-state location.

* * * *

(m) *Tractor Exemption for Phase 1 Certified Tractors*

(1) A 2013 model year Phase 1 Certified Tractor is exempt from the requirements of section 95303(a).

NOTE: Authority cited: Sections 39600, 39601, 38510, 38560 and 38560.5, Health and Safety Code. Reference: Sections 39600, 38560, 38560.5 and 38580, Health and Safety Code.* * * *

APPENDIX I-C

PROPOSED REGULATION ORDER FOR OPTIONAL LOW NOX EMISSION STANDARDS

Note: Set forth below are the proposed amendments to title 13, California Code of Regulations, section 1956.8. Proposed amendments to existing sections are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions. Subsections for which no changes are proposed in this rulemaking are indicated with [No change] or "* * * *".

§ 1956.8. Exhaust Emission Standards and Test Procedures - 1985 and Subsequent Model Heavy-Duty Engines and Vehicles.

(a)(1) *[Exhaust emission standards for new 1985 through 2003 model heavy-duty diesel engines, heavy-duty natural-gas-fueled and liquefied-petroleum-gas-fueled engines derived from diesel-cycle engines, and for new 1993 through 2003 model heavy-duty methanol-fueled diesel engines – No change]*

(a)(2)(A) The exhaust emissions from new 2004 and subsequent model heavy-duty diesel engines, heavy-duty natural gas–fueled and liquefied-petroleum-gas-fueled engines derived from diesel-cycle engines, and heavy-duty methanol-fueled diesel engines, and the optional, reduced-emission standards for 2002 and subsequent model engines produced beginning October 1, 2002, except in all cases engines used in medium-duty vehicles, shall not exceed:

Exhaust Emission Standards for 2004 and Subsequent Model Heavy-Duty Engines, and Optional, Reduced Emission Standards for 2002 and Subsequent Model Heavy-Duty Engines Produced Beginning October 1, 2002, Other than Urban Bus Model-Year Engines Produced From October 1, 2002 Through 2006[L]
(grams per brake horsepower-hour [g/bhp-hr])

Date of Release: October 23, 2013
Date of Hearing: December 12, 2013

Model Year	*Oxides of Nitrogen Plus Non-methane Hydrocarbons*	*Optional Oxides of Nitrogen Plus Non-methane Hydrocarbons*	*Oxides of Nitrogen*	*Optional Oxides of Nitrogen*	*Non-methane Hydrocarbons*	*Carbon Monoxide*	*Particulates*
2004-2006[H]	2.4[A,C,E,J]	2.5[B,C,E,J]	n/a		n/a	15.5	0.10[C]
October 1, 2002-2006	n/a	1. 8 to 0.3[A,D,F]	n/a		n/a	15.5	0.03 to 0.01[G]
2007 and subsequent[M]	n/a	n/a	0.20[I]		0.14	15.5	0.01[K]
2015 and Subsequent (Optional)[N,O]	n/a	n/a	n/a	0.10, 0.05, or 0.02	0.14	15.5	0.01

[Footnotes A through M – No change]

[N] Optional Low NOx emission standards. A manufacturer may choose to offer an engine that is 50%, 75%, or 90% below the current 0.20 g/bhp-hr NOx emission standards for heavy duty engines.

[O] On-Board Diagnostic (OBD) requirements are to be followed per Title 13, CCR, section 1971.1. However, the manufacturer may request Executive Officer approval of manufacturer-proposed emission threshold based malfunction criteria in lieu of the defined emission threshold based malfunction criteria required for each monitor in section 1971.1. The Executive Officer shall approve the request upon finding that:

(A) the manufacturer has used good engineering judgment in determining the malfunction criteria,

(B) the malfunction criteria will provide for similar timeliness in detection of malfunctioning components with respect to detection of malfunctions on engines certified to the malfunction criteria specified in section1971.1,

(C) the malfunction criteria are set as stringently as technologically feasible with respect to indicating a malfunction at the lowest possible tailpipe emission levels (but not lower than the malfunction criteria specified for each monitor in section 1971.1 except for additive NOx malfunction criteria (e.g., NOx standard plus 0.2 g/bhp-hr), in which case the malfunction criteria may not be lower than 2.0 times the applicable NOx standard), considering the best available monitoring technology to the extent that it is known or should have been known to the manufacturer,

(D) the malfunction criteria will prevent detection of a malfunction when the monitored component is within the performance specifications for components aged to the end of the full useful life, and

(E) the manufacturer has provided emission data showing the emission levels at which the malfunctions are detected.

[Footnote I – No change]

(a)(2)(B) *[Phase-in Options – No change]*

(a)(3) *[Formaldehyde exhaust emission standards from new 1993 and subsequent model methanol-fueled diesel engines, shall not exceed;– No change]*

(a)(4) *[Optional certification requirements for bi-fueled heavy-duty engines – No change]*

(a)(5) *[Crankcase emission requirements for new 2007 and subsequent model heavy-duty diesel engines – No change]*

(a)(6) *[Engine idling requirements for 2008 and subsequent model heavy-duty diesel engines – No change]*

(b) *Test Procedures.* The test procedures for determining compliance with standards applicable to 1985 and subsequent model heavy-duty diesel engines and vehicles and the requirements for participating in the averaging, banking and trading programs, are set forth in the "California Exhaust Emission Standards and Test Procedures for 1985 through 2003 Model Heavy-Duty Diesel-Engines and Vehicles," adopted April 8, 1985, as last amended December 12, 2002, the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles," adopted December 12, 2002, as last amended ~~April 18, 2013~~ [INSERT AMENDMENT DATE], and the "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes," adopted October 24, 2002, which are incorporated by reference herein.

(c)(1)(A) *[Exhaust emission standards for 1987 through 2004 model heavy-duty Otto-cycle engines – No change]*

(c)(1)(B) The exhaust emissions from new 2005 and subsequent model heavy-duty Otto-cycle engines, except for Otto-cycle medium- and heavy-duty engines subject to the alternative standards in 40 CFR §86.005-10(f), shall not exceed:

California Emission Standards for 2005 and Subsequent Model Heavy-Duty Otto-Cycle Engines[A]
(in g/bhp-hr)

Model Year	Emission Category	NMHC + NOx	NMHC	NOx	CO[F,G]	HCHO	PM
Standards for Heavy-Duty Otto-Cycle Engines Used in 2005 through 2019 Model Incomplete Medium-Duty Vehicles 8,501 to 10,000 pounds GVW[B] and 2005 and Subsequent Model Incomplete Medium-Duty Vehicles 10,001 to 14,000 pounds GVW[C]							
2005 through 2007	ULEV	1.0[G,E,D,F]	n/a	n/a	14.4	0.05	n/a
	SULEV	0.5[D,F]	n/a	n/a	7.2	0.025	n/a
2008 and subsequent	ULEV	n/a	0.14[E,F]	0.20[E,F]	14.4	0.01	0.01
	SULEV	n/a	0.07[E,F]	0.10[E,F]	7.2	0.005	0.005
Standards for Heavy-Duty Otto-Cycle Engines Used In Heavy-Duty Vehicles Over 14,000 pounds GVW							
2005 through 2007	n/a	1.0[D,F]	n/a	n/a	37.1	0.05[E]	n/a
2008 and subsequent	n/a	n/a	0.14[E,F]	0.20[E,F]	14.4	0.01	0.01
2015 and subsequent[H]	Optional	n/a	0.14	0.10, 0.05, or 0.02[H,I]	14.4	0.01	0.01

[A] These standards apply to petroleum-fueled, alcohol-fueled, liquefied petroleum gas-fueled and natural gas-fueled Otto-cycle engines.

[B] For the 2020 and subsequent model years, medium-duty vehicles 8,501 to 10,000 pounds GVW must certify to the primary emission standards and test procedures for complete vehicles specified in section 1961.2, title 13, CCR.

[C] A manufacturer of engines used in incomplete medium-duty vehicles may choose to comply with these standards as an alternative to the primary emission standards and test procedures for complete vehicles specified in section 1961 or 1961.2, title 13, CCR. A manufacturer that chooses to comply with these optional heavy-duty engine standards and test procedures shall specify, in the Part I application for certification, an in-use compliance test procedure, as provided in section 2139(c), title 13 CCR.

[D] A manufacturer may request to certify to the Option 1 or Option 2 federal NMHC + NOx standards as set forth in 40 CFR § 86.005-10(f). However, for engines used in medium-duty vehicles, the formaldehyde level must meet the standard specified above.

[E] This standard only applies to methanol-fueled Otto-cycle engines.

[F] A manufacturer may elect to include any or all of its medium- and heavy-duty Otto-cycle engine families in any or all of the emissions ABT programs for HDEs, within the restrictions described in section I.15 of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines," incorporated by reference in section 1956.8(d). For engine families certified to the Option 1 or 2 federal standards, the FEL must not exceed 1.5 g/bhp-hr. If a manufacturer elects to include engine families certified to the 2005 and subsequent model year standards, the NOx plus NMHC FEL must not exceed 1.0 g/bhp-hr. For engine families certified to the 2008 and subsequent model year standards, the FEL is the same as set forth in 40 CFR 86.008-10(a)(1). ABT does not apply to optional low NOx emission standards.

[G] Idle carbon monoxide: For all Otto-cycle heavy-duty engines utilizing aftertreatment technology, and not certified to the on-board diagnostics requirements of section 1968, et seq, as applicable, the CO emissions shall not exceed 0.50 percent of exhaust gas flow at curb idle.

[H] Optional Low NOx emission standards. A manufacturer may choose to offer an engine that is 50%, 75%, or 90% below the current 0.20 g/bhp-hr NOx emission standards for heavy duty engines.

[1] On Board Diagnostic (OBD) requirements are to be followed using Title 13, CCR, section 1971.1. However, the manufacturer may request Executive Officer approval of manufacturer-proposed malfunction criteria in lieu of the defined malfunction criteria required for each monitor in section 1971.1. The Executive Officer shall approve the request upon finding that:
(A) the manufacturer has used good engineering judgment in determining the malfunction criteria,
(B) the malfunction criteria will provide for similar timeliness in detection of malfunctioning components with respect to detection of malfunctions on engines certified to the malfunction criteria specified in section1971.1,
(C) the malfunction criteria are set as stringently as technologically feasible with respect to indicating a malfunction at the lowest possible tailpipe emission levels (but not lower than the malfunction criteria specified for each monitor in section 1971.1), considering the best available monitoring technology to the extent that it is known or should have been known to the manufacturer,
(D) the malfunction criteria will prevent detection of a malfunction when the monitored component is within the performance specifications for components aged to the end of the full useful life, and
(E) the manufacturer has provided emission data showing the emission levels at which the malfunctions are detected.

(c)(2) *[Formaldehyde exhaust emission standards for new 1993 and subsequent model methanol-fueled Otto-cycle engines, shall not exceed – No change]*

(c)(3) *Optional Standards for Complete and Incomplete Heavy-Duty Vehicles that Use Heavy-Duty Otto-Cycle Engines. [No change]*

(d) The test procedures for determining compliance with standards applicable to 1987 and subsequent model heavy-duty Otto-cycle engines and vehicles are set forth in the "California Exhaust Emission Standards and Test Procedures for 1987 through 2003 Model Heavy-Duty Otto-Cycle Engines and Vehicles," adopted April 25, 1986, as last amended December 27, 2000, the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines," adopted December 27, 2000, as last amended ~~April 18, 2013~~[insert amendment date], the "California Non-Methane Organic Gas Test Procedures," adopted July 12, 1991, as last amended December 6, 2012, and the "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles, in the Urban Bus and Heavy-Duty Vehicle Classes," adopted October 24, 2002, which are incorporated by reference herein.

* * * *

NOTE: Authority cited: Sections 39500, 39600, 39601, 43013, 43018, 43100, 43101, 43102, 43104, 43105, 43106, 43107 and 43806, Health and Safety Code; and Section 28114, Vehicle Code. Reference: Sections 39002, 39003, 39017, 39033, 39500, 39650, 39657, 39667, 39701, 40000, 43000, 43009, 43009.5, 43013, 43017, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43107, 43202, 43204, 43205, 43205.5, 43206, 43210, 43211, 43212, 43213 and 43806, Health and Safety Code; and Section 28114, Vehicle Code.

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APPENDIX I-C-1

State of California
AIR RESOURCES BOARD

PROPOSED
OPTIONAL LOW NOX EMISSION STANDARD AMENDMENTS TO

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2004 AND SUBSEQUENT MODEL HEAVY-DUTY DIESEL-ENGINES AND VEHICLES

Adopted:	December 12, 2002
Amended:	July 24, 2003
Amended:	September 1, 2006
Amended:	July 26, 2007
Amended:	October 17, 2007
Amended:	October 14, 2008
Amended:	September 27, 2010
Amended:	October 12, 2011
Amended:	March 22, 2012
Amended:	December 6, 2012
Amended:	April 18, 2013 (Corrected by Section 100)
Amended:	[INSERT DATE OF AMENDMENT]

Note: The proposed amendments to this document are shown in underline to indicate additions and strikeout to indicate deletions compared to the test procedures as adopted April 18, 2013. [No change] indicates proposed federal provisions that are also proposed for incorporation herein without change. Existing intervening text that is not amended in this rulemaking is indicated by "* * * *".

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2004 AND SUBSEQUENT MODEL HEAVY-DUTY DIESEL ENGINES AND VEHICLES

The following provisions of Subparts A, I, N, S, and T, Part 86, and of Subparts A through K, Part 1065, Title 40, Code of Federal Regulations, as adopted or amended by the U.S. Environmental Protection Agency on the date set forth next to the applicable section listed below, and only to the extent they pertain to the testing and compliance of exhaust emissions from heavy-duty diesel engines and vehicles, are adopted and incorporated herein by this reference as the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," except as altered or replaced by the provisions set forth below.

PART 86 – CONTROL OF EMISSIONS FROM NEW AND IN-USE HIGHWAY VEHICLES AND ENGINES

I. GENERAL PROVISIONS FOR CERTIFICATION AND IN-USE VERIFICATION OF EMISSIONS.

* * * *

Subpart A - General Provisions for Emission Regulations for 1977 and Later Model Year New Light-Duty Vehicles, Light-Duty Trucks, and Heavy-Duty Engines, and for 1985 and Later Model Year New Gasoline-Fueled, Natural Gas-Fueled, Liquefied Petroleum Gas-Fueled and Methanol-Fueled Heavy-Duty Vehicles.

* * * *

2. Definitions. [§86.xxx-2]

A. Federal Provisions.

1. **§86.004-2** January 18, 2001. [All federal definitions apply, except as otherwise noted below. Definitions specific to other requirements are contained in separate documents.]

2. **§86.010-2** April 30, 2010. [All federal definitions apply, except as otherwise noted below. Definitions specific to other requirements are contained in separate documents.]

B. California Provisions.

"Administrator" means the Executive Officer of the Air Resources Board.

"Certificate of Conformity" means "Executive Order" certifying vehicles for sale in California.

"Certification" means certification as defined in Section 39018 of the Health and Safety Code.

"**EPA**" shall also mean Air Resources Board or Executive Officer of the Air Resources Board
"**EPA Enforcement Officer**" means the Executive Officer or his delegate.
"**Measurement allowance**" means accuracy margin.
"**Medium-duty engine**" means a heavy-duty engine that is used to propel a medium-duty vehicle.
"**Medium-duty vehicle**" means 2004 through 2006 model year heavy-duty low-emission vehicle, ultra-low-emission vehicle, super-ultra-low-emission vehicle or zero-emission vehicle certified to the standards in title 13, CCR, section 1960.1(h)(2) having a manufacturer's gross vehicle weight rating of 14,000 pounds or less; and any 2004 and subsequent model heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission vehicle certified to the standards in title 13, CCR section 1956.8(h), having a manufacturer's gross vehicle weight rating between 8,501 and 14,000 pounds.
"**NTE standard**" means NTE emission limit.
"**Optional Low NOx Engine**" means a 2015 and subsequent model heavy-duty diesel engine certified to the optional low NOx emission standards, which are below the 0.20 g/bhp-hr emission standard for 2007 and subsequent model engines. The optional low NOx emission standards are 0.10, 0.05, or 0.02 g/bhp-hr.
"**Warranty period**" [For guidance see title 13, CCR, §2036].

* * * *

11. Emission standards for diesel heavy-duty engines and vehicles. [§86.xxx-11]

* * * *

B. California provisions.

* * * *

7. **Optional Low NOx Emission Standards for Heavy Duty Engines for 2015 and Subsequent Model Year.** Manufacturers may elect to certify heavy duty engines to the following optional low NOx emission standards in lieu of the primary NOx emissions standard of 0.20 g/bhp-hr.

Optional Low NOx Exhaust Emission Standards for 2015 and Subsequent Model Year (grams per brake-horsepower-hour or g/bhp-hr)				
	NOx	NMHC or NMHCE	CO	PM
Optional Low NOx 0.10	0.10	0.14	15.5	0.01
Optional Low NOx 0.05	0.05	0.14	15.5	0.01
Optional Low NOx 0.02	0.02	0.14	15.5	0.01

* * * *

15. NOx plus NMHC and particulate averaging, trading, and banking for heavy-duty engines [§86.xxx-15].

A. Federal provisions.

* * * *

B. California provisions

1. For medium-duty diesel-cycle engines certified under title 13, CCR §1956.8(h):

(a) Credits may be generated by an alternative mechanism proposed by the engine manufacturer and approved by the Executive Officer of the ARB. The alternative credit-generating mechanism shall not include any attribute expressly prohibited under the federal ABT program, such as cross-class or cross-fuel trading.

(b) Manufacturers must annually submit a proposed plan for generating credits to the Executive Officer of the ARB and have it approved prior to sale of engines of that model year in California.

2. Optional Low NOx Engines shall not be used to generate credits in the ABT program.

* * * *

35. Labeling. [§86.xxx-35].

* * * *

B. California provisions.

* * * *

5. For 2015 and subsequent model year heavy-duty and medium-duty diesel cycle engines certified to the Optional Low NOx Engine emission standards in subparagraph A.11.B.7., the label shall contain the following statement: "This engine conforms to California regulations applicable to XXXX model year heavy-duty diesel engines and is certified to the Optional Low NOx Engine emission standard of XXX g/bhp-hr."

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APPENDIX I-C-2

State of California
AIR RESOURCES BOARD

PROPOSED
OPTIONAL LOW NOX EMISSION STANDARD AMENDMENTS TO

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2004 AND SUBSEQUENT MODEL HEAVY-DUTY OTTO-CYCLE ENGINES

Adopted:	December 27, 2000
Amended:	December 12, 2002
Amended:	July 26, 2007
Amended:	October 17, 2007
Amended:	September 27, 2010
Amended:	March 22, 2012
Amended:	December 6, 2012
Amended:	April 18, 2013 (Corrected by Section 100)
Amended:	[INSERT DATE OF AMENDMENT]

Note: The proposed amendments to this document are shown in underline to indicate additions and strikeout to indicate deletions compared to the test procedures as adopted April 18, 2013. [No change] indicates proposed federal provisions that are also proposed for incorporation herein without change. Existing intervening text that is not amended in this rulemaking is indicated by "* * * *".

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2004 AND SUBSEQUENT MODEL HEAVY-DUTY OTTO-CYCLE ENGINES

The following provisions of Subparts A, N, and P, Part 86, Title 40, Code of Federal Regulations ("CFR"), as adopted or amended by the U.S. Environmental Protection Agency on the date set forth next to the 40 CFR Part 86 section listed below, and only to the extent they pertain to the testing and compliance of exhaust emissions from heavy-duty Otto-cycle engines, are adopted and incorporated herein by this reference as the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines," with the following exceptions and additions.

Part I. GENERAL PROVISIONS FOR CERTIFICATION AND IN-USE VERIFICATION OF EMISSIONS

Subpart A - General Provisions for Emission Regulations for 1977 and Later Model Year New Light-Duty Vehicles, Light-Duty Trucks and Heavy-Duty Engines, and for 1985 and Later Model Year New Gasoline-Fueled, Natural Gas-Fueled, Liquefied Petroleum Gas-Fueled and Methanol-Fueled Heavy Duty Vehicles

* * * *

2. **Definitions.** [§86.xxx-2]

A. Federal provisions.

All of the definitions in previous CFR sections continue to apply, except as otherwise noted below. Definitions specific to other requirements such as evaporative emissions are contained in those separate documents.

1. §86.004-2. January 18, 2001.
2. §86.010-2. February 24, 2009.

B. California provisions.

"**Administrator**" means the Executive Officer of the Air Resources Board.

"**Certificate of Conformity**" means "Executive Order" certifying vehicles for sale in California.

"**Certification**" means certification as defined in Section 39018 of the Health and Safety Code.

"**EPA**" means "Air Resources Board" or the Executive Officer of the Air Resources Board.

"**EPA Enforcement Officer**" means the Executive Officer of the Air Resources Board or his delegate.

"**Medium-Duty Engine**" means a heavy-duty engine that is used in a medium-duty vehicle.

"**Medium-Duty Vehicle**" means any 1992 through 2006 model-year heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission

vehicle certified to the standards in section 1960.1(h)(2) having a manufacturer's gross vehicle weight rating of 14,000 pounds or less and any 2000 and subsequent model heavy-duty low-emission, ultra-low-emission, super-ultra-low-emission or zero-emission vehicle certified to the standards in section 1961(a)(1), 1961.2, or 1962 having a manufacturer's gross vehicle weight rating between 8,500 and 14,000 pounds.

"**Optional Low NOx Engine**" means a 2015 or subsequent model heavy-duty Otto-cycle engine certified to the optional low NOx emission standards, which are below the 0.20 g/bhp-hr emission standard for 2007 and subsequent model engines. The optional low NOx emission standards are 0.10, 0.05, or 0.02 g/bhp-hr.

Warranty means the warranty provisions set forth in title 13, California Code of Regulations §2036.

* * * *

10. **Emission standards for Otto-cycle heavy-duty engines and vehicles.** [§86.xxx-10]

A. Federal provisions.

* * * *

B. California provisions.

1. Exhaust emissions from new 2004 and later model year Otto-cycle medium- and heavy-duty engines, except for Otto-cycle medium- and heavy-duty engines subject to the alternative standards in 40 CFR §86.005-10(f), shall not exceed:

California Emission Standards for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines[A]
(in g/bhp-hr)

Model Year	Emission Category	NMHC + NOx	NMHC	NOx	CO[H]	HCHO	PM
Standards for Heavy-Duty Otto-Cycle Engines Used In 2004 through 2019 Model Medium-Duty Vehicles 8,501 to 10,000 pounds GVW[B] and 2004 and Subsequent Model Medium-Duty Vehicles 10,001 to 14,000 pounds GVW[C]							
2004	ULEV	2.4 **or** 2.5 with 0.5 NMHC cap[D]	n/a	n/a	14.4	0.05	n/a
	SULEV	2.0	n/a	n/a	7.2	0.025	n/a
2005 through 2007[F]	ULEV	1.0[D,F]	n/a	n/a	14.4	0.05	n/a
	SULEV	0.5[D,F]	n/a	n/a	7.2	0.025	n/a
2008 and subsequent[G]	ULEV	n/a	0.14[F]	0.20[F]	14.4	0.01	0.01
	SULEV	n/a	0.07[F]	0.10[F]	7.2	0.005	0.005
Standards for Heavy-Duty Otto-Cycle Engines Used In Heavy-Duty Vehicles Over 14,000 pounds GVW							
2004	n/a	2.4 **or** 2.5 with 0.5 NMHC cap[D]	n/a	n/a	37.1	0.05[E]	n/a
2005 through 2007[F]	n/a	1.0[~~C,E~~D,F]	n/a	n/a	37.1	0.05[E]	n/a
2008 and subsequent[G]	n/a	n/a	0.14[F]	0.20 [~~E~~F]	14.4	0.01	0.01
2015 and subsequent[I]	Optional	n/a	0.14	0.10, 0.05, or 0.02	14.4	0.01	0.01

[A] These standards apply to petroleum-fueled, alcohol-fueled, liquefied petroleum gas-fueled and natural gas-fueled Otto-cycle engines. Alcohol-fueled engines have the option of certifying to the organic material hydrocarbon equivalent ("OMHCE") or organic material non-methane hydrocarbon equivalent ("OMNMHCE") standard.

[B] For the 2020 and subsequent model years, medium-duty vehicles 8,501 to 10,000 pounds GVW must certify to the primary emission standards and test procedures for complete vehicles specified in section 1961.2, title 13, CCR.

[C] A manufacturer of engines used in incomplete medium-duty vehicles may choose to comply with these standards as an alternative to the primary emission standards and test procedures for complete vehicles specified in section 1961 or 1961.2, title 13, CCR. A manufacturer that chooses to comply with these optional heavy-duty engine standards and test procedures shall specify, in the Part I application for certification, an in-use compliance test procedure, as provided in section 2139(c), title 13 CCR.

[D] A manufacturer may request to certify to the Option 1 or Option 2 federal NMHC + NOx standards as set forth in 40 CFR §86.005-10(f). However, for engines used in medium-duty vehicles the formaldehyde level must meet the standard specified above.

[E] This standard only applies to methanol-fueled Otto-cycle engines.

[F] A manufacturer may elect to include any or all of its medium- and heavy-duty Otto-cycle engine families in any or all of the emissions ABT programs for HDEs, within the restrictions

described in section I.15 of these test procedures. For engine families certified to the Option 1 or 2 federal standards the FEL must not exceed 1.5 g/bhp-hr. If a manufacturer elects to include engine families certified to the 2005 and subsequent model year standards, the NOx plus NMHC FEL must not exceed 1.0 g/bhp-hr. For engine families certified to the 2008 and subsequent model year standards, the FEL is the same as set forth in 40 CFR 86.008-10(a)(1). ABT does not apply to optional low NOx emission standard engines.

[G] A manufacturer may elect to include any or all of its medium- and heavy-duty Otto-cycle engine families in any or all of the emissions ABT programs for HDEs, within the restrictions described in section I.15 of these test procedures.

[H] Idle carbon monoxide: For all Otto-cycle heavy-duty engines utilizing aftertreatment technology, and not certified to the on-board diagnostics requirements of title 13, CCR, §1968, et seq, as applicable, the CO emissions shall not exceed 0.50 percent of exhaust gas flow at curb idle.

[I] Optional Low NOx Emission Standards from Heavy Duty Engines. Manufacturers may choose to produce heavy duty engines that emit less NOx emissions than standard 0.20 g/bhp-hr engines.

2. **Optional Standards for Complete and Incomplete Heavy-Duty Vehicles.**

Manufacturers may request to group complete and incomplete heavy-duty vehicles into the same test group as vehicles certifying to the LEV III exhaust emission standards and test procedures specified in title 13, CCR, §1961.2, so long as those complete and incomplete heavy-duty Otto-cycle vehicles meet the most stringent LEV III standards to which any vehicle within that test group certifies.

* * * *

15. **NOx and particulate averaging, trading, and banking for heavy-duty engines.** [§86.xxx-15.]

A. Federal provisions.

1. §86.004-15. October 6, 2000. [No change.]
2. §86.007-15. January 18, 2001. Amend as follows:
   2.1 Subparagraphs (a) through (m)(2): [No change.]
   2.2 Subparagraph (m)(3): Delete.
   2.3 Subparagraphs (m)(4) through m(10). [No change.]

B. California provisions.

1. Optional Low NOx Engines shall not be used to generate credits in the ABT program.

* * * *

35. **Labeling.** [§86.xxx-35]

A. Federal provisions.

1. §86.001-35. April 6, 1994.

1.1 Add the following sentence to the introductory paragraph: The labeling requirements of this section shall apply to all new motor vehicle engines certified according to the provisions of California Health and Safety Code Section 43100.

2. §86.007-35. August 30, 2006. [No change, except as noted above for §86.001-35.]

B. California Provisions

1. For 2004 through 2007 model year engines certified to the optional standards in §86.005-10(f) the following statement shall also be printed on the label, "This engine conforms to the California ULEV standards applicable to 20XX model year Heavy-Duty Otto-Cycle Engines."

2. For 2015 and subsequent model year Otto- cycle engines certified to the Optional Low NOx Engine emission standards, the label shall contain the following statement: "This engine conforms to California regulations applicable to XXXX model year heavy-duty Otto-cycle engines and is certified to the Optional Low NOx Engine emission standard of XXX g/bhp-hr."

* * * *

APPENDIX I-D

PROPOSED REGULATION ORDER FOR AMENDMENTS TO THE AIRBORNE TOXIC CONTROL MEASURE TO LIMIT DIESEL-FUELED COMMERICAL MOTOR VEHICLE IDLING

Note: Set forth below are the proposed amendments to title 13, California Code of Regulations, section 2485. Proposed amendments to existing sections are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions. Subsections for which no changes are proposed in this rulemaking are indicated with [No change] or "* * * *".

§ 2485. Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling.

(a) *Purpose*. The purpose of this airborne toxic control measure is to reduce public exposure to diesel particulate matter and other air contaminants by establishing idling restrictions, emission standards, and other requirements for heavy-duty diesel engines and alternative idle reduction technologies to limit~~ing~~ the idling of diesel-fueled commercial motor vehicles.

(b) *Applicability*. This section applies to any person, business, or government agency that owns, operates, or causes to operate the equipment listed below, at any location in California:

(1) diesel-fueled commercial motor vehicles that operate in the State of California with gross ~~vehicular~~ vehicle weight ratings of greater than 10,000 pounds that are or must be licensed for operation on highways. This specifically includes:

~~(1)~~(A) California-based vehicles; and

~~(2)~~(B) Non-California-based vehicles; and

(2) alternative idle reduction technologies including but not limited to internal combustion engine auxiliary power systems (APS), fuel-fired heaters, battery-electric APSs, and other technologies installed on diesel-fueled commercial motor vehicles.

(c) *Requirements*.

(1) *Idling Restriction*:

(A) Between February 1, 2005 through December 31, 2014, ~~On or after February 1, 2005~~, the driver of any vehicle subject to this section shall comply with the following requirements, except as noted in subsection (d) below:

Date of Release: October 23, 2013
Date of Hearing: December 12, 2013

~~(A)~~1. ~~t~~The driver shall not idle the vehicle's primary diesel engine for greater than 5.0 minutes at any location.

~~(B)~~2. ~~t~~The driver shall not operate a diesel-fueled auxiliary power system (APS) to power a heater, air conditioner, or any ancillary equipment on that vehicle during sleeping or resting in a sleeper berth for greater than 5.0 minutes at any location when within 100 feet of a restricted area.

(B) Except as provided in subsection (d) below, on or after January 1, 2015, any person that owns, operates, or causes to operate any diesel-fueled commercial motor vehicle subject to the requirements of this section shall comply with the following requirements:

1. No vehicle subject to this section shall idle for more than 5 consecutive minutes at any location.

2. No diesel-fueled APS subject to this section shall be operated for greater than 5 minutes at any location when within 100 feet of a restricted area.

(C) On or after January 1, 2015, the driver of a vehicle subject to the requirements of this section must, upon request, provide the following information to authorized enforcement personnel:

1. driver's license;

2. vehicle registration; and

3. motor carrier's information set forth in subsection(c)(1)(D), below.

(D) On or after January 1, 2015, a motor carrier that dispatches a vehicle subject to the requirements of this section must provide the following information to a dispatched driver:

1. motor carrier's business name

2. motor carrier's street address, state, zip code;

3. motor carrier contact person's name; and

4. motor carrier contact person's business phone number.

(2) *Use of Alternative Technologies.*

(A) Between January 1, 2008 through December 31, 2014, ~~On or after January 1, 2008~~, the driver shall not operate an internal combustion APS on any vehicle equipped with a 2007 and subsequent model year primary diesel engine unless the vehicle is:

1. equipped with an APS meeting the emissions performance requirements found in subsection (c)(3)(A), below; and

2. the vehicle is equipped with a label meeting the requirements pursuant to section 35.B.4 of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as incorporated by reference in title 13, CCR, section 1956.8(b).

(B) Between January 1, 2008 through December 31, 2014, ~~On or after January 1, 2008~~, the driver shall not operate a fuel-fired heater on any vehicle equipped with a 2007 and subsequent model year primary diesel engine unless the fuel-fired heater meets the emissions performance requirements found in subsection (c)(3)(B), below;

(C) Between January 1, 2008 through December 31, 2014, ~~On or after January 1, 2008,~~ the driver of a vehicle equipped with a 2006 or older model year primary diesel engine may use and operate in California any certified internal combustion APS with or without the additional PM control specified in subsection (c)(3)(A)1. or any other certified alternative idle~~ing~~ reduction technology. In addition, the APS or idle reduction technology used or operated on such a vehicle is exempt from the requirements specified in subsection (c)(3), below.

(D) Except as provided in subsection (d) below, on or after January 1, 2015, any person who owns or operates any vehicle equipped with an alternative technology subject to the requirements of this section shall comply with the following requirements:

1. No internal combustion APS installed on any vehicle equipped with a primary diesel engine certified to the 2007 and subsequent model year engine standards set forth in title 13, CCR, section 1956.8, shall be operated at any location in California unless:

   a. the APS is verified to comply with the emission performance requirements found in subsection (c)(3)(A), below; and

   b. the vehicle is equipped with a label for a verified APS meeting the requirements set forth in section 35.B.4 of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as last amended on April 18, 2013, which is incorporated by reference herein.

2. No fuel-fired heater installed on any vehicle equipped with a primary diesel engine certified to the 2007 and subsequent model year engine standards set forth in title 13, CCR, section 1956.8, shall be operated at any location in California unless the fuel-fired

heater meets the emission performance requirements found in subsection (c)(3)(B), below;

3. Any internal combustion APS equipped with a California or federally certified off-road engine or any other certified alternative idle reduction technology may be installed and operated on a vehicle equipped with a primary diesel engine certified to the 2006 or older model year engine standards set forth in title 13, CCR, section 1956.8. In addition, the APS or idle reduction technology used or operated on such a vehicle is exempt from the requirements specified in subsection (c)(3), below

(3) *Idle Reduction Technology Compliance Requirements.* As an alternative to idling the primary engine, diesel-fueled engines/vehicles may, as an option, be equipped with alternative technologies, as listed and defined below in subsections (c)(3)(A), (c)(3)(B), and (c)(3)(C) ~~of this subsection~~. If so equipped, these technologies are subject to the following requirements:

(A) *Internal Combustion APS.*

1. In order to operate in California, an APS utilizing an internal combustion engine must comply with applicable California off-road and/or federal non-road emission standards and test procedures for its fuel type and power category. In addition, diesel-fueled APSs installed on vehicles equipped with primary engines certified to the 2007 and subsequent model year heavy-duty diesel-engine standards, pursuant to section 1956.8(a)(2)(A) of title 13, CCR, shall either,

a. be equipped with a verified Level 3 in-use strategy for particulate matter control (see title 13, CCR, sections 2700 to 2710), or

b. have its exhaust routed directly into the vehicle's exhaust pipe, upstream of the diesel particulate matter aftertreatment device.

2. With advance Executive Officer approval, a certifying/verifying APS manufacturer may petition for an alternate compliance strategy other than described in (A)1.a. or b. in this subsection above. However, this provision is limited to manufacturers that can demonstrate, to the satisfaction of the Executive Officer, that their alternative strategy is equivalent (or "cleaner"), from an emissions standpoint, compared to the requirement described in (A)1.a. or b. in this subsection above. As an example, strategies that can use the available electric power infrastructure, instead of solely operating a diesel-fueled APS for engine and/or cab heating and cooling, may be able to use such a strategy to demonstrate compliance with these requirements.

(B) *Fuel-Fired Heaters.* Fuel-fired heaters must comply with the applicable California emission standards and test procedures as specified in the Low Emission Vehicle program requirements found in title 13, CCR, subsections 1961(a)(15) and (d), or in Part I.E.1.13 of the "California Exhaust Emission Standards and Test Procedures for 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," ~~California Exhaust Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light-Duty Trucks and Medium- Duty Vehicles,"~~ as incorporated by reference in title 13, CCR, section 1961(d). However, the specified requirement that limits fuel-fired heaters from being operated above 40°F does not apply.

(C) *Other Idle Reduction Technologies.* Other technologies that will reduce idling emissions may also be used, including the use of batteries, fuel cells, power inverter/chargers for on-shore electrical power, on-shore electric power infrastructure also known as truck stop electrification, and other technologies that produce minimal or no emissions. With the exception of battery and fuel cell powered APSs, power inverter/chargers, and electric power infrastructure, the use of other technologies ~~are~~ is subject to advance Executive Officer approval and must be at least as effective in reducing idling emissions as the technologies described in subsections (c)(3)(A), above, or the NOx idling emission standard specified in title 13, CCR, section 1956.8(a)(6)(C), The Executive Officer shall use good engineering judgment and test data to determine if an idle reduction technology provides idling emission controls equivalent to the standards specified in subsection (c)(3)(A) above, or in title 13, CCR, section 1956.8(a)(6)(C).

(D) *Labeling Requirements.* 2007 and subsequent model year commercial diesel vehicles equipped with an internal combustion APS meeting the requirements specified in subsection (c)(3)(A) shall have a label affixed to the hood of the vehicle to allow operation of the APS in California. The labels shall meet the requirements specified in section 35.B.4 of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as incorporated by reference in title 13, CCR, section 1956.8(b).

(d) *Exceptions.*

(1) Except when a vehicle is located within 100 feet of a restricted area, subsections (c)(1)(A)1 and (c)(1)(B)1 does not apply, if the vehicle is equipped with

(A) a primary diesel engine meeting the optional NOx idling emission standard pursuant to title 13, CCR, section 1956.8(a)(6)(C); and

(B) a label meeting the requirements pursuant to section 35.B.4 of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," as incorporated by reference in title 13, CCR, section 1956.8(b).

(2) Subsection (c)(1) does not apply for the period or periods during which

(A) a bus is idling for

1. up to 10.0 minutes prior to passenger boarding, or

2. when passengers are onboard;

(B) prior to January 1, 2008, idling of the primary diesel-engine is necessary to power a heater, air conditioner, or any ancillary equipment during sleeping or resting in a sleeper berth. This provision does not apply when operating within 100 feet of a restricted area;

(C) idling when the vehicle must remain motionless due to traffic conditions, an official traffic control device, or an official traffic control signal over which the driver has no control, or at the direction of a peace officer, or operating a diesel-fueled APS or other device at the direction of a peace officer;

(D) idling when the vehicle is queuing that at all times is beyond 100 feet from any restricted area;

(E) idling of the primary diesel engine, operating a diesel-fueled APS, or operating other devices when forced to remain motionless due to immediate adverse weather conditions affecting the safe operation of the vehicle or due to mechanical difficulties over which the driver has no control;

(F) idling to verify that the vehicle is in safe operating condition as required by law and that all equipment is in good working order, either as part of a daily vehicle inspection or as otherwise needed, provided that such engine idling is mandatory for such verification;

(G) idling of the primary diesel engine, operating a diesel-fueled APS, or operating other devices is mandatory for testing, servicing, repairing, or

diagnostic purposes, including regeneration or maintenance of the exhaust emission control device during engine idling when the dashboard indicator light, if so equipped, is illuminated indicating that regeneration or maintenance is in progress;

(H) idling when positioning or providing a power source for equipment or operations, other than transporting passengers or propulsion, which involve a power take off or equivalent mechanism and is powered by the primary diesel engine for:

1. controlling cargo temperature, operating a lift, crane, pump, drill, hoist, mixer (such as a ready mix concrete truck), or other auxiliary equipment;

2. providing mechanical extension to perform work functions for which the vehicle was designed and where substitute alternate means to idling are not reasonably available; or

3. collection of solid waste or recyclable material by an entity authorized by contract, license, or permit by a school or local government;

(I) idling of the primary diesel engine, operating a diesel-fueled APS, or operating other devices when operating defrosters, heaters, air conditioners, or other equipment solely to prevent a safety or health emergency;

(J) idling of the primary diesel engine, operating a diesel-fueled APS, or operating other devices by authorized emergency vehicles while in the course of providing services for which the vehicle is designed;

(K) idling of military tactical vehicles during periods of training, testing, and deployment;

(L) idling when operating equipment such as a wheelchair or people assist lift as prescribed by the Americans with Disabilities Act;

(M) idling of armored cars in the course of providing services for which the vehicle is designed; and

(N) idling of workover rigs while performing work for which the vehicle is designed.

(e) *Relationship to Other Law.*

Nothing in this section allows idling in violation of other applicable law, including, but not limited to:

(1) California Vehicle Code ~~S~~section 22515;

(2) ~~T~~title 13, CCR, ~~S~~section 2480~~, California Code of Regulations~~;

(3) title 13, CCR, section 1956.8

(~~3~~4) California Health and Safety Code ~~S~~section 40720; or

(45) any applicable ordinance, rule, or requirement as stringent as, or more stringent than, this section.

(f) *Enforcement.* This section may be enforced by the Air Resources Board; peace officers as defined in California Penal Code, title 3, chapter 4.5, Sections 830 et seq. and their respective law enforcement agencies' authorized representatives; and air pollution control or air quality management districts.

(g) *Penalties.* For violations of subsection (c)(1), (c)(2) or (c)(3), that occur prior to January 1, 2015, the driver of a subject vehicle is subject to a minimum civil penalty of 300 dollars and to criminal penalties as specified in the Health and Safety Code and the Vehicle Code~~.~~

On or after January 1, 2015, any person who violates any requirement of this section is subject to the penalties set forth in California Health and Safety Code sections 39674, 39675, 42400 et seq., 42402 et seq. and 42410 and 43704.

(h) *Definitions.* The following definitions apply to this section:

(1) "Armored car" is as defined in California Vehicle Code ~~S~~section 115

(2) "Authorized emergency vehicle" is as defined in California Vehicle Code ~~S~~section 165.

(3) "Auxiliary power system" or "APS" means any device that is permanently dedicated to the vehicle on which it is installed and provides electrical, mechanical, or thermal energy to the primary diesel engine, truck cab and/or sleeper berth, bus's passenger compartment or any other commercial vehicle's cab, as an alternative to idling the primary diesel engine.

(4) "Bus" means any vehicle defined in ~~T~~title 13, CCR~~alifornia Code of Regulations~~, ~~S~~section 2480, subsections (h) (13)-(16), inclusive or as defined in the California Vehicle Code ~~S~~section 233.

(5) "Commercial Motor Vehicle" means any vehicle or combination of vehicles defined in California Vehicle Code ~~S~~section 15210(b) and any other motor truck or bus with a gross vehicle weight rating of 10,001 pounds or more, except the following:

(A) a zero emission vehicle; or

(B) a pickup truck as defined in California Vehicle Code ~~S~~section 471.

(6) "Driver" is as defined in California Vehicle Code ~~S~~section 305.

(7) "*Emission standard*" as it applies to compliance with the requirements and standards set forth in this section, and the remedies provided for in the Health and Safety Code for noncompliance, relates to the emission characteristics of a motor vehicle or off-road engine and means:

(A) a numerical limit on the amount of a given pollutant that a motor vehicle engine or off-road engine may emit into the atmosphere; or

(B) a requirement that a motor vehicle , motor vehicle engine, or off-road engine be equipped with a certain type of pollution-control device or some other design feature related to the control of emissions.

(8) "*Evaporative emission standards*" are a subset of emission standards that refer to the specific motor vehicle fuel evaporative emission standards and test procedures incorporated by reference in title 13, CCR section 1976 to which a vehicle is certified.

(9) "*Exhaust emission standards*" or "*tailpipe emission standards*" are a subset of emission standards that collectively refer to the specific standards to which a motor vehicle, motor vehicle engine, or off-road engine is certified.

(10) "Executive Officer" means the Executive Officer of the California Air Resources Board or his or her delegate.

~~(7)~~(11) "Fuel-fired heater" means a fuel burning device that creates heat for the purpose of (1) warming the cab or sleeper berth compartment of a vehicle or (2) warming the engine oil and/or coolant for easy start-up of the vehicle's engine but does not contribute to the propulsion of the vehicle.

~~(8)~~(12) "Gross vehicle weight rating" is as defined in California Vehicle Code ~~S~~section 350.

~~(9)~~(13) "Highway" is as defined in California Vehicle Code ~~S~~section 360.

(~~10~~)(14) "Idling" means the vehicle engine is running at any location while the vehicle is stationary.

(15) "Motor Carrier" means a person providing transportation of goods or passengers for compensation.

~~(11)~~(16) "Motor truck" or "motortruck" means a motor vehicle designed, used, or maintained primarily for the transportation of property.

~~(12)~~(17) "Official traffic control device" is as defined in California Vehicle Code ~~S~~section 440.

~~(13)~~(18) "Official traffic control signal" is as defined in California Vehicle Code ~~S~~section 445.

~~(14)~~(19) "Owner" ~~is as defined in Vehicle Code Section 460~~ means the person or persons registered as the owner of the vehicle by the California Department of Motor Vehicles or its equivalent in another state, province, or country (presumed at the time of violation to be the person or persons identified as the owner on the registration document or title carried on the vehicle). For the purposes of this section, the definition of an owner excludes a lessor or a renter who leases or rents vehicles without a driver for a fixed rate or price, and does not operate or permit to operate the vehicle at the time of violation.

(20) "Person" means an individual, corporation, business trust, estate, trust, partnership, limited liability company, association, joint venture, government, governmental subdivision, agency, instrumentality, public corporation, or any other legal or commercial entity.

~~(15)~~(21) "Primary diesel engine" means the diesel-fueled engine used for vehicle propulsion.

~~(16)~~(22) "Queuing" means (A) through (C)

(A) the intermittent starting and stopping of a vehicle;

(B) while the driver, in the normal course of doing business, is waiting to perform work or a service; and

(C) when shutting the vehicle engine off would impede the progress of the queue and is not practicable.

(D) Queuing does not include the time a driver may wait motionless in line in anticipation of the start of a workday or opening of a location where work or a service will be performed.

~~(17)~~(23) "Restricted area" means any real property zoned for individual or multifamily housing units, schools, hotels or motels, that has one or more of such units on it.

~~(18)~~(24) "Safety or health emergency" means:

(A) a sudden, urgent, or usually unforeseen, occurrence; or

(B) a foreseeable occurrence relative to a medical or physiological condition.

~~(19)~~(25) "Sleeper berth" is as defined in ~~T~~title 13, CCR~~alifornia Code of Regulations~~, ~~S~~section 1265.

~~(20)~~(26) "Vehicle" is as defined in the California Vehicle Code ~~S~~section 670.

~~(21)~~(27) "Workover rig" is as defined in ~~S~~section 2449 of ~~T~~title 13, CCR~~alifornia Code of Regulations~~.

(i) *Severability.*

If any section, paragraph, subparagraph, sentence, clause, phrase, or portion of the section is, for any reason, held invalid, unconstitutional, or unenforceable by any court of competent jurisdiction, such portion shall be deemed as a separate, distinct, and independent provision, and such holding shall not affect the validity of the remaining portions of this section.

NOTE: Authority cited: Sections 39600, 39601, 39614(b)(6)(A), 39658, 39667, 43000.5(d), 43013(b), 43013(h), 43018(b) and 43018(c), Health and Safety Code; and *Western Oil & Gas Assn. v. Orange County Air Pollution Control Dist.* (1975),14 Cal.3d.411. Reference: Sections 39002, 39003, 39027, 39500, 39600, 39650, 39655, 39656, 39657, 39658, 39659, 39662, 39665, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3, 42402, 42402.1, 42402.2, 42402.3, 42403.5, 42410, 43013, 43018 and 43704, Health and Safety Code; Sections 305, 336, 350, 440, 445, 545, 546, 642, 680, 21400, 22452, 22515, 27153, 40001and 40001(b)(5), California Vehicle Code; and Sections 1201,1900, 1962 and 2480, Title13, California Code of Regulations.

APPENDIX I-E

PROPOSED REGULATION ORDER FOR AMENDMENTS TO HEAVY-DUTY HYBRID-ELECTRIC VEHICLE CERTIFICATION PROCEDURES

Note: Set forth below are the proposed amendments to title 13, California Code of Regulations, section 1956.8. Proposed amendments to existing sections are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions. Subsections for which no changes are proposed in this rulemaking are indicated with [No change] or "* * * *".

§ 1956.8. Exhaust Emission Standards and Test Procedures - 1985 and Subsequent Model Heavy-Duty Engines and Vehicles.

* * * *

(b) *Test Procedures.* The test procedures for determining compliance with standards applicable to 1985 and subsequent model heavy-duty diesel engines and vehicles and the requirements for participating in the averaging, banking and trading programs, are set forth in the "California Exhaust Emission Standards and Test Procedures for 1985 through 2003 Model Heavy-Duty Diesel-Engines and Vehicles," adopted April 8, 1985, as last amended December 12, 2002, the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles," adopted December 12, 2002, as last amended April 18, 2013, and the "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric and Other Hybrid Vehicles~~,~~ in the Urban Bus and Heavy-Duty Vehicle Classes," adopted October 24, 2002, as last amended[DATE OF AMENDMENT], which are incorporated by reference herein.

* * * *

(d) The test procedures for determining compliance with standards applicable to 1987 and subsequent model heavy-duty Otto-cycle engines and vehicles are set forth in the "California Exhaust Emission Standards and Test Procedures for 1987 through 2003 Model Heavy-Duty Otto-Cycle Engines and Vehicles," adopted April 25, 1986, as last amended December 27, 2000, the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines," adopted December 27, 2000, as last amended April 18, 2013, the "California Non-Methane Organic Gas Test Procedures," adopted July 12, 1991, as last amended December 6, 2012, and the "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicles~~,~~ in the Urban Bus and Heavy-Duty Vehicle Classes," adopted October 24, 2002, as last amended [DATE OF AMENDMENT], which are incorporated by reference herein.

Date of Release: October 23, 2013
Date of Hearing: December 12, 2013

* * * *

NOTE: Authority cited: Sections 39500, 39600, 39601, 43013, 43018, 43100, 43101, 43102, 43104, 43105, 43106, 43107 and 43806, Health and Safety Code; and Section 28114, Vehicle Code. Reference: Sections 39002, 39003, 39017, 39033, 39500, 39650, 39657, 39667, 39701, 40000, 43000, 43000.5, 43009, 43009.5, 43013, 43017, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43107, 43202, 43204, 43205, 43205.5, 43206, 43210, 43211, 43212, 43213 and 43806, Health and Safety Code; and Section 28114, Vehicle Code.

Appendix I-E-1

State of California
AIR RESOURCES BOARD

PROPOSED AMENDMENTS TO THE CALIFORNIA INTERIM CERTIFICATION PROCEDURES FOR 2004 AND SUBSEQUENT MODEL HYBRID-ELECTRIC AND OTHER HYBRID VEHICLES, IN THE URBAN BUS AND HEAVY-DUTY VEHICLE CLASSES

Adopted: October 24, 2002
Amended: [INSERT DATE OF AMENDMENT]

Note: The proposed amendments to this document are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions compared to the test procedures as adopted October 24, 2002.

~~Note: The entire text of this document, which is incorporated by reference in sections 156.1 and 156.8, title 13, CCR, is new language.~~

Date of Release: October 23, 2013
Date of Hearing: December 12, 2013

PROPOSED AMENDMENTS TO THE CALIFORNIA INTERIM CERTIFICATION PROCEDURES FOR 2004 AND SUBSEQUENT MODEL HYBRID-ELECTRIC AND OTHER HYBRID VEHICLES, IN THE URBAN BUS AND HEAVY-DUTY VEHICLE CLASSES

A. Applicability

The certification procedures in this document are applicable to new 2004 and subsequent model year heavy-duty, greater than 14,000 lbs gross vehicle weight rating (GVWR) hybrid-electric vehicles and including hybrid-electric urban transit buses (HEBs) and other hybrid vehicles. Requirements specified for hybrid-electric vehicles also apply to other hybrid vehicles, as appropriate.

General procedures and requirements necessary to certify a heavy-duty engine for sale in California are set forth in "California Exhaust Emission Standards and Test Procedures for 1985 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles" (hereinafter "HDD TPs"), as incorporated in title 13, CCR, section (§)1956.8(b), and "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines," (hereinafter "HDO TPs"), as incorporated in title 13, CCR, section §1956.8(d), for testing and compliance of heavy-duty diesel and Otto-cycle engines with exhaust emission standards.

The interim certification procedures, as amended December 12, 2013, are optional for the 2004 through 2006 and subsequent model years heavy-duty hybrid-electric and other hybrid vehicles. The Executive Officer shall review test results and in use data gathered from the 2004 through 2006 model years and make recommendations to the Board in 2006 for modifying certification procedures for 2007 and subsequent model year HEBs and heavy-duty hybrid-electric vehicles.

B. Definitions

These certification procedures incorporate by reference the definitions and abbreviations set forth in 40 CFR §86.001-2 (October 22, 1996) and §86.004-2 (January 18, 2001 June 8, 2012), the definitions and abbreviations set forth in the HDD TPs, the definitions set forth in the HDO TPs, and the definitions set forth in title 13, CCR, sections §1956.1 through 1956.8, title 13, CCR, §2023 (Jan. 31, 2006), 40 CFR, §86.1803-01 (October 15, 2012), and Society of Automotive Engineers (SAE) J2711, "Recommended Practice for Measuring Energy Consumption of Conventional and Hybrid Heavy-Duty Vehicles Using a Chassis Dynamometer" (Proposed Draft May 2012), unless otherwise amended below.

1. **"Auxiliary ~~p~~Power ~~u~~Unit (~~APU~~)"** means a device that converts consumable fuel energy into mechanical or electrical energy. Examples of auxiliary power units are internal combustion engines, turbines, flywheels, and fuel cells.

2. **"Average Loaded Vehicle Weight"** means the average between a vehicle's curb and GVWR.

3. **"Baseline Conventional Engine"** means the heavy-duty engine in a specific heavy-duty engine family certified by the Executive Officer that will be used in a conventional vehicle. Certified engine emissions from the selected engine will be used in calculating a baseline emission factor for a conventional vehicle.

~~2~~4. **"Baseline ~~HEB~~ Hybrid-Electric Drive System ~~e~~Engine"** means the ~~most representative~~ heavy-duty engine in a specific heavy-duty engine family certified by the Executive Officer that will be used in a hybrid-electric drive system for a specific ~~HEB~~ engine family. Certified emissions from the selected engine will be used in calculating an emission factor to determine the appropriate emission reduction for a particular hybrid-electric drive system.

~~3~~5. **"Baseline ~~urban transit bus~~ Vehicle"** means a representative, ~~non-hybrid-electric urban transit bus~~ conventional vehicle selected by the Executive Officer for chassis dynamometer testing. The Executive Officer will have the final discretion in determining a representative baseline vehicle for any specific hybrid-electric vehicle and/or for any groups of vehicles or vocations. Exhaust emissions from the selected ~~urban transit bus~~ baseline vehicle, as determined by the chassis dynamometer test procedure, will be used in conjunction with the certified emissions from the engine incorporated into the baseline ~~urban transit bus~~ vehicle to calculate a baseline emission factor.

~~4~~6. **"Battery"** means a device that stores chemical energy and releases electrical energy.

7. **"Battery Current Throughput "** means the net change in integrated current of a battery at any given point in time relative to another point in time, expressed in Ampere-hours. The current throughput of the battery in a fully charged state (i.e., vehicle off charge and beginning the first cycle of a full charge test) may be defined as zero, or a value representing the measured current into the battery during recharge (where zero battery current throughput is the nominal level during charge-sustaining operation).

~~5~~8. **"Battery ~~r~~Rated Ampere-hour ~~c~~Capacity"** means the manufacturer-rated capacity of a battery in Ampere-hours obtained from a battery discharged at the manufacturer's recommended discharge rate (C/1 – C/6) such that a specified minimum cut-off terminal voltage is reached.

~~6~~9. **"Battery State of Charge ~~(SOC)~~"** means the quantity of electric energy remaining in the battery relative to the maximum rated Ampere-hour ~~(Ah)~~ capacity of the battery expressed in percent.

~~7~~10. **"Capacitor"** means a device that stores energy electrostatically and releases electrical energy.

~~8~~11. **"Capacitor ~~SOC~~ State of Charge"** means the actual measured energy content of a capacitor and expressed as a percentage of the capacitor's maximum rated voltage squared (V^2).

~~9~~12. **"CCR"** means California Code of Regulations.

~~10~~13. **"CFR"** means Code of Federal Regulations.

14. **"Charge-Depleting Actual Range (Rcda)"** means the distance traveled at which the off-board electrical energy was exhausted and charge-sustaining operation began. The total distance, measured from the start of the full charge test, through any subsequent charge-depleting test cycles, and ending at a point in the Transitional Cycle proportional to the change in state of charge of the Transitional Cycle compared to the cycle previous to the Transitional Cycle. This range shall be reported to the nearest 0.1 miles.

15. **"Charge-Depleting Cycle Range (Rcdc)"** for a given test full charge test, the total distance traveled in the full charge test until the end of the last cycle before the net off-board electrical energy has been exhausted. Typically, all subsequent cycles are charge-sustaining. Rcdc range includes the Transitional Cycle where vehicle may have operated in both depleting and sustaining modes. If the full charge test possesses a Transitional Range, then the Rcdc is the total distance traveled until the end of the last cycle that does not satisfy the Net Energy Change tolerance. This range shall be reported to the nearest 0.1 miles.

~~11~~6. **"Charge-~~d~~Depleting ~~HEB~~ Hybrid-Electric Vehicle"** means ~~an~~ ~~HEB~~ hybrid-electric vehicle that is designed to be recharged off-board under normal conditions. Under conditions of continuous operation, the rechargeable energy storage system ~~(RESS)~~ of a charge-depleting ~~HEB~~ hybrid-electric vehicle ultimately fully discharges and impairs vehicle operation when no off-board charging is performed and the consumable fuel is regularly replenished.

17. **"Charge-Depleting Mode"** means an operating mode of a hybrid-electric vehicle in which the vehicle runs by consuming only the electric energy from the main batteries or along with the fuel energy simultaneously or sequentially until the Charge-Sustaining Mode starts.

~~12~~8. **"Charge-~~s~~Sustaining ~~HEB~~ Hybrid-Electric Vehicle** " means ~~an~~ ~~HEB~~ hybrid-electric vehicle that derives all of its energy from on-board consumable fuel under normal usage. Under conditions of continuous

operation, the ~~RESS~~ rechargeable energy storage system of a charge-sustaining ~~HEB~~ hybrid-electric vehicle does not fully discharge and impair vehicle operation when no off-board charging is performed and the consumable fuel is regularly replenished.

19. "**Charge-Sustaining Mode**" means an operating mode where the hybrid-electric vehicle runs by consuming the fuel energy while sustaining the electric energy of the rechargeable energy storage system at a certain level while the vehicle is driven.

20. "**Consumable Fuel**" means any solid, liquid, or gaseous matter that releases energy when consumed by an auxiliary power unit.

21. "**Curb Weight**" means the total weight of the vehicle with all standard equipment, including batteries/capacitors, lubricants at nominal capacity, and the weight of optional equipment. Incomplete trucks shall have the curb weight specified by the manufacturer.

~~13~~22. "**Electric ~~d~~Drive ~~c~~Components**" means the electric motor, system controller, generator, on board charge, and energy storage system (batteries, capacitors, and flywheels).

~~14~~23. "**Electromechanical ~~f~~Flywheel**" means a device that stores rotational kinetic energy and releases that kinetic energy to an electric motor-generator system, thereby producing electrical energy.

~~15~~24. "**Electromechanical ~~f~~Flywheel ~~SOC~~State of Charge**" means a percentage of the flywheel's maximum-rated revolutions per minute squared (rpm^2), which is based on the actual measured energy content of an electromechanical flywheel.

~~16~~25. "**Emission ~~f~~Factor**" means the number calculated from exhaust emissions chassis dynamometer test results and engine dynamometer test results for a ~~HEB~~ hybrid-electric vehicle or conventional ~~urban transit bus~~ vehicle. The number, expressed in units of bhp-hr/mi, is used to calculate an emission factor ratio.

~~17~~26. "**Emission Factor Ratio**" means the number resulting from dividing the emission factor for a ~~HEB~~ hybrid-electric vehicle by the emission factor for a baseline ~~urban transit bus~~ vehicle, and reflects the emission reduction capability of a hybrid-electric drive system.

27. "**End of Test**" means the portion of the full charge test where charge-sustaining behavior is observed. Charge-sustaining operation is validated if the difference in state of charge of the last cycle or last series of cycles is less than 2% of the total depleted capacity or the net energy change tolerance, whichever is larger.

28. "**Flywheel**" See "Electromechanical Flywheel"

29. **"Full Charge Test"** means test cycles are repeated until the vehicle has exhausted the energy designed to be consumed during charge-depleting mode.

30. **"Gross Vehicle Weight Rating (GVWR)"** means the value specified by the manufacturer as the maximum design loaded weight of a single vehicle.

~~18~~31. **"Hybrid-eElectric ~~d~~Drive ~~s~~System"** means the propulsion system comprised of the ~~APU~~ auxiliary power unit and the corresponding electric drive components connected with that ~~APU~~ auxiliary power unit.

~~19~~32. **"Hybrid-~~e~~Electric ~~u~~Urban ~~t~~Transit ~~b~~Bus (HEB)"** ~~means an urban bus equipped with at least two sources of energy stored on board; this energy is converted to motive power using an electric drive motor and an APU. The electric drive motor must be used partially or fully to drive the vehicle's wheels.~~ See "Hybrid-Electric Vehicle".

~~20~~33. **"HEB Family"** means the basic classification unit of a manufacturer's product line used for the purpose of test fleet selection, based on gross vehicle weight (either 24,000 lbs to 44,000 lbs, or greater than 44,000 lbs). A family may include any engine that certifies to the same standard as the HEB test vehicle.

34. **"Hybrid-Electric Vehicle"** means a heavy-duty vehicle, including urban bus that can draw propulsion energy from both of the following sources of stored energy: 1) a consumable fuel and 2) a rechargeable energy storage system that is recharged by an electric motor-generator system, an external electric energy source, or both.

35. **"Hybrid Engine Family"** means the grouping of engines and hybrid drive system, based on similar emission characteristics that are used in hybrid vehicles with gross vehicle weight greater than 14,000 lbs.

~~21~~36. **"Net Energy Change ~~(NEC)~~"** means the net change in energy level of a ~~RESS~~ rechargeable energy storage system expressed in Joules (watt-seconds).

37. **"Plug-In Hybrid-Electric Vehicle"** means a hybrid-electric vehicle that has the capability to charge the battery from an off-vehicle electric source, such that the off-vehicle source cannot be connected to the vehicle while the vehicle is in motion.

~~22~~38. **"Propulsion eEnergy"** means energy that is derived from the vehicle's consumable fuel and/or ~~RESS~~ rechargeable energy storage system to drive the wheels. If an energy source is supplying energy only to vehicle accessories (e.g., a 12-volt battery on a conventional vehicle), it is not acting as a source of propulsion energy.

~~23~~39. **"Propulsion sSystem"** means a system that, when started, provides propulsion for the vehicle in an amount proportional to what the driver commands.

~~2540~~. **"Rechargeable Energy Storage System ~~(RESS)~~"** means a component, or system of components, that stores energy and for which the supply of energy is rechargeable by an electric motor-generator system, an off-vehicle electric energy source, or both. Examples of ~~RESS~~ rechargeable energy storage system for ~~HEBs~~ hybrid-electric vehicles include batteries, capacitors, and electromechanical flywheels.

~~2441~~. **"Regenerative ~~b~~Braking"** means ~~deceleration of the bus caused by operating an electric motor-generator system. This act returns energy to the vehicle propulsion system and provides charge to the RESS or to operate on-board accessories.~~ the partial recovery of the energy normally dissipated into friction braking that is returned as electrical current to an energy storage device.

~~2642~~. **"~~SOC~~ State of Charge"** See "Battery ~~SOC~~ State of Charge", "Capacitor State of Charge", and "Electromechanical Flywheel State of Charge".

~~2743~~. **"~~SOC~~ State of Charge ~~delta~~"** means ~~delta~~ the change in ~~a~~Ampere-hours, V^2, or rpm^2 measured during a test.

~~2844~~. **"~~SOC~~ State of Charge ~~final~~"** means state of charge at the end of a test run (Ampere-hours ~~Ah~~, V^2, or rpm^2).

~~2945~~. **"~~SOC~~ State of Charge ~~initial~~"** means state of charge at the beginning of a test run (Ampere-hours ~~Ah~~, V^2, or rpm^2).

46. "Urban Bus" means a passenger-carrying vehicle powered by a heavy heavy-duty diesel engine, or of a type normally powered by a heavy heavy-duty diesel engine, with a load capacity of fifteen or more passengers and intended primarily for intra-city operation, i.e., within the confines of a city or greater metropolitan area. Urban bus operation is characterized by short rides and frequent stops. To facilitate this type of operation, more than one set of quick-operating entrance and exit doors would normally be installed. Since fares are usually paid in cash or token, rather than purchased in advance in the form of tickets, urban buses would normally have equipment installed for the collection of fares. Urban buses are also typically characterized by the absence of equipment and facilities for long distance travel, e.g., restrooms, large luggage compartments, and facilities for stowing carry-on luggage.

~~3047~~. **"Total Fuel Energy"** means the total energy content of the fuel, in British Thermal Units (Btu) or Kilowatt-Hour (kWh), consumed during a test as determined by carbon balance or other standard method and calculated based on the lower heating value of the fuel.

C. Heavy-Duty Hybrid-Electric ~~Drive System~~ Vehicle Certification Requirements

Compliance with the heavy-duty hybrid-electric vehicle criteria pollutant standards requires the development of an emission factor ratio for a heavy-duty hybrid-electric drive system with a certified baseline engine and comparison of the corresponding emissions with the applicable (e.g., urban bus or heavy-duty diesel or Otto-cycle engine) exhaust emission standards for a given engine by model year.

For model years 2004 through 2006, no more than two parties (i.e. the engine/turbine/fuel cell manufacturer and the hybrid-electric drive system manufacturer) shall be granted an individual Executive Order identifying the emission standard achieved by the engine/turbine/fuel cell and the hybrid-electric drive system. For 2007 and subsequent model years, only one Executive Order shall be granted identifying the emission standard achieved by the hybrid-electric drive system or vehicle.

1. One Party Responsibility. Where one party is responsible for emissions, an Executive Order shall be granted identifying the emission standard achieved by the ~~HEB~~ hybrid-electric vehicle.

1.1 Certification Standards. All 2004 and subsequent model year HEBs shall, by model year, meet the exhaust emission standards or optional emission standards set forth in title 13, CCR, ~~section~~ §1956.1. All 2007 and subsequent model year hybrid-electric vehicles shall, by model year, meet the exhaust emission standards set forth in title 13, CCR, §1956.8. The criteria pollutant exhaust emissions for the hybrid-electric drive system of the ~~HEB~~ hybrid-electric vehicle shall be determined in accordance with section D of this document. The criteria pollutant certification standard for the hybrid-electric drive system shall be determined in accordance with section E of this document.

2. Two Party Responsibility. For model years 2004 through 2006, ~~W~~where two parties are responsible for emissions, two Executive Orders shall be granted. One Executive Order shall be granted to the engine/turbine/fuel cell manufacturer identifying the emission standard achieved and one Executive Order shall be granted to a second party identifying the emission standard of the hybrid-electric drive system.

2.1 Certification Standards. For model years 2004 through 2006, the heavy-duty engine, turbine, or fuel cell used as a motive source in an HEB shall, by model year and size, meet the exhaust emission standards or optional emission standards set forth in title 13, CCR, ~~section~~ §1956, 1956.1, 1956.7, or 1956.8. ~~All 2004 and subsequent model year hybrid-electric drive systems shall, by model year, meet the exhaust emission standards or optional emission standards set forth in title 13, CCR, section 1956.1~~. The exhaust emissions for a

hybrid-electric drive system shall be determined in accordance with section D of this document. The certification standard for the hybrid-electric drive system shall be determined in accordance with section E of this document.

3. **25 Percent Reduction Claim.** For the 2004 through 2006 model years, hybrid-electric drive system manufacturers may claim a 25 percent reduction from the NOx certification standard of the engine or turbine incorporated as part of the hybrid-electric drive system in lieu of following the test procedures set forth in sections ~~E~~D and ~~F~~E. During that period, the Executive Officer may request the manufacturer to perform chassis testing of an HEB selecting this option in accordance with the test procedures in sections D and E. If testing data indicate a reduction of exhaust emissions of less than 25 percent, the HEB family shall receive that smaller reduction.

4. **Useful Life.** For the 2004 through 2006 model years, the useful life of the hybrid-electric drive system shall be 5 years or 150,000 miles, whichever comes first. ~~After that time~~ For the 2007 and subsequent model years, the useful life of the engine and hybrid-~~electric~~ drive system in a hybrid engine family shall meet the useful life requirements as required for a conventional engine certified for use in the same vehicle service class as the hybrid engine family ~~for urban transit buses as~~ set forth in title 13, CCR, ~~section~~ §2112(l)(19),(20),(21), or (22) as last amended ~~October 24, 2002~~ August 7, 2012.

5. **Emissions Warranty.** For the 2004 and subsequent model years, the hybrid-electric drive system shall, by model year, meet the warranty requirements listed in title 13, CCR, ~~section~~ §2035 and 2036, as last amended ~~December 26, 1990~~ November 9, 2007 and ~~May~~ April 15, 1999, respectively.

6. **Durability and Emission Testing.** An HEB family with less than 50 HEBs sold for the 2004 through 2006 model years shall be exempt from durability-data vehicle and emission-data vehicle testing. An HEB family in California with 50 or more HEBs sold, and any 2007 and subsequent model year ~~HEB~~ hybrid engine families shall meet the durability-data vehicle and emission-data vehicle testing as required in title 13, CCR, ~~section~~ §2111 et seq., as last amended ~~December~~ November ~~28~~, 20~~10~~10.

7. **Labeling Requirements.** The hybrid-electric drive system shall meet labeling requirements as set forth in title 13, CCR, ~~section~~ §1965, as amended by the HDD TPs and the HDO TPs. In addition to the information required by those labeling requirements, the hybrid-electric drive system manufacturer shall also include the following information on the hybrid-electric drive system label:

7.1 An unconditional statement of compliance with the appropriate model year California regulations; for example:

"This vehicle (engine or hybrid-electric drive system, as applicable)

conforms to California regulations applicable to [insert MY date] model year new, ___(for 2004 and subsequent model years, specify heavy-duty Otto-cycle engines, heavy-duty diesel engines, or urban ~~transit~~ bus engine, as applicable)."

For federally certified vehicles certified for sale in California, the statement must include the phrase "conforms to U.S. EPA regulations and is certified for sale in California."

For 2004-2006 ~~and later~~ model years hybrid-electric drive systems to be used in urban buses that incorporate an on-road heavy-duty diesel engine and are certified to the optional reduced-emission standards, the label shall contain the following statement in lieu of the above:

"This hybrid-electric drive system conforms to California regulations applicable to [insert MY date] model year new urban bus engines and is certified to a NOx plus NMHC optional reduced-emission standard of [insert appropriate number] g/bhp-hr (for optional reduced-emission standards specify between 0.3 and 1.8, inclusive, at 0.3 g/bhp-hr increments), and a particulate matter standard of [insert appropriate number] g/bhp-hr (specify 0.03 g/bhp-hr, 0.02 g/bhp-hr, or 0.01 g/bhp-hr)."

7.2 For 2004 and subsequent model year hybrid-electric drive systems used in urban ~~transit~~ buses, if the manufacturer is assigned an alternative useful life period by the Executive Officer, the label shall contain the statement:

"This hybrid-electric drive system has been certified to meet California standards for a useful life period of [specify] years or [specify] miles of operation, whichever occurs first. This hybrid-electric drive system's actual life may vary depending on its service application."

The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than years or miles (e.g., hours or miles only).

7.3 For 2004 and subsequent model year hybrid-electric drive systems used in urban ~~transit~~ buses, the label shall contain the statement:

"This hybrid-electric drive system has a primary intended service application as an urban ~~transit~~ bus engine. It is certified to the emission standards applicable to an urban ~~transit~~ bus."

7.4 For 2015 and subsequent model year hybrid-electric drive systems used in heavy-duty vehicles, the label shall contain the statement:

"This hybrid-electric drive system has a primary intended service

application as [specify application] engine. It is certified to the emission standards applicable to [specify an urban bus or a heavy-duty vehicle weight category]"

8. **Engine Service Manuals and Equipment Maintenance Signals.** The hybrid-electric drive system manufacturer shall meet service manual and maintenance signal requirements as set forth in 40 CFR, §86.004-38 (~~October 21, 1997~~June 27, 2003) and §86.007-38 (~~January 18, 2001~~ June 29, 2004) as amended by the HDD TPs and the HDO TPs.

9. **Rebuild Provisions and Recordkeeping Requirement.** The heavy-duty engine rebuilding practices set forth in 40 CFR, §86.004-40 (~~October 21, 1997~~ January 18, 2001) as amended in the HDD TPs and HDO TPs shall also apply to the hybrid-electric drive system.

10. **Information Requirements.** In addition to the requirements set forth in 40 CFR, §86.1843-01(c), the HDD TPs and the HDO TPs, the certification application shall include the following:

10.1 Identification of California certified engine, engine family name, and model code.

10.~~1~~2 Identification and description of the hybrid-electric drive system covered by the application.

10.3 Description of any modification of hardware and/or software to accommodate the hybrid-electric drive system.

10.~~2~~4 Identification of the heavy-duty vehicle weight category to which the vehicle is certifying: light heavy-duty, medium heavy-duty, heavy heavy-duty, heavy-duty Otto, or urban ~~transit~~ bus; and the curb weight and ~~gross vehicle weight rating~~ GVWR of the vehicle.

10.~~3~~5 Identification and description of the propulsion system for the vehicle.

10.~~4~~6 Identification and description of the climate control system used on the vehicle.

10.~~5~~7 Projected number of heavy-duty hybrid-electric vehicles produced and delivered for sale in California.

10.~~6~~8 All information necessary for the proper and safe operation of the vehicle, including information on the safe handling of the battery system, emergency procedures to follow in the event of battery leakage, or other malfunctions that may affect the safety of the vehicle operator or laboratory personnel.

10.~~7~~9 Method for determining battery state-of-charge ~~and any other relevant information as determined by the Executive Officer~~.

10.10 Any other relevant information as determined by the Executive Officer.

11. Safety Procedures. For 2004 and subsequent model years, a manufacturer shall conform to the requirements specified in title 13, CCR, division 2, chapter 6.5, articles 1, 3, and 8, inclusive.

12. Hydraulic, Turbine, Flywheel, or Fuel Cell Hybrid Vehicles. The certification application will be considered by the Executive Officer on a case-by-case basis. Upon approval of the Executive Officer, the stated certification requirements on section C shall be followed for these hybrid vehicles, as applicable.

D. Heavy-Duty Hybrid-Electric ~~Drive System~~ Vehicle Test Procedures

These test procedures incorporate by reference SAE J2711, "~~Recommended Practice for Measuring Fuel Economy and Emissions of Hybrid-Electric and Conventional Heavy-Duty Vehicles~~" "Recommended Practice for Measuring Energy Consumption of Conventional and Hybrid Heavy-Duty Vehicles Using a Chassis Dynamometer" (~~April 2002~~) (Proposed Draft May 2012), as modified in these test procedures to apply to HEBs and hybrid-electric vehicles sold in California. For ~~2004 through 2006~~ 2015 and subsequent model years, heavy-duty hybrid-electric vehicles may follow these or equivalent procedures provided the manufacturer obtains prior written approval from the Executive Officer ~~(EO)~~.

The test procedure for determining compliance with standards applicable to the hydraulic, turbine, flywheel, or fuel cell used as the motive power in a hybrid-electric ~~bus~~ vehicle shall be determined by the Executive Officer on a case-by-case basis.

1. Chassis Dynamometer Test Preparations

1.1 Test Site. The ambient temperature levels encountered by the test vehicle shall be no less than 20 °C (68 °F) and no greater than 30 °C (86 °F). Ambient temperatures shall be recorded at the beginning and end of the test period. Adequate test site capabilities for safe venting and cooling of batteries representative of in-use operation, protection from exposure to high voltage, and any other necessary precaution shall be provided during testing. Test conditions specified in 40 CFR, Part 86 and Part 1065 shall apply, as appropriate. A fixed-speed fan shall direct cooling air to the vehicle to maintain the engine operating temperature as specified by the manufacturer during testing, and shall be operated only when the vehicle is in operation and shall be switched off for all key off dwell periods. Fans for brake cooling may be utilized during testing.

1.2 Pre-Test Data Collection. Vehicle demographics shall be recorded prior to testing including the vehicle identification number, gross vehicle weight (from vehicle data plate), curb weight (from vehicle data plate or by weighing), engine manufacturer, model year and type, certified engine family, engine serial number, engine displacement and number of cylinders, engine rated power/torque and speed, tire size, transmission type, manufacturer, model, number of speeds, presence or absence of retarder, lock up torque converter, exhaust gas aftertreatment type, and rear axle ratio. Pre-test data shall also include details of the type, power, and speed of the electric motor(s); and type and capacity of the ~~RESS~~ rechargeable energy storage system. The chassis test laboratory shall be used to measure actual cycle distance during a test.

1.3 Fuel Specifications. The test fuel shall meet the certification specifications set forth in the HDD TPs and HDO TPs.

1.4 Vehicle Preparation. Vehicle preparation and preconditioning shall be conducted in accordance with 40 CFR, §86.1231-90 (April 11, 1989) and 40 CFR, §86.1232-960 (~~April 11, 1989~~December 8, 2005), respectively.

1.4.1 Prior to testing, the vehicle shall be stabilized to a manufacturer-determined distance or to 4,000 miles. Charge-depleting vehicles, for which regular, off-vehicle charging is recommended, shall have their rechargeable energy storage system fully recharged prior to testing. This recharge should occur at least once between each refilling of consumable fuel; however, charging frequency for the rechargeable energy storage system shall not be greater than is anticipated during normal vehicle use.

1.4.2 Vehicles shall be tested at ~~curb weight plus driver weight and one-half seated passenger load using a weight of 150 lbs per passenger~~ the prescribed test weight presented in Table 1.

Table 1

Vehicle Class	Prescribed Test Weight
Light Heavy-Duty (14,001 to 19,500 lbs)	Average Loaded Vehicle Weight
Medium Heavy-Duty (19,501 to 33,000 lbs)	Average Loaded Vehicle Weight
Heavy Heavy-Duty (Greater than 33,000 lbs)	Average Loaded Vehicle Weight
Buses	Driver + ½ seated passenger capacity @ 150 lbs/person

1.4.3 Manufacturer's recommended tires and pressures shall be used. For dynamometer testing, t~~T~~ire pressures shall be set at the beginning of

the test at the pressure used to establish the dynamometer road-load coefficients and shall not exceed levels necessary for safe operation. Tires shall be conditioned as recommended by the vehicle manufacturer and shall be the same size as would be used in service.

1.4.4 The vehicle lubricants normally specified by the manufacturer shall be used.

1.4.5 Vehicles shall be tested with normal appendages (mirrors, bumpers, etc.). Certain items (e.g., hub caps) may be removed where necessary for safety on the dynamometer.

1.4.~~5~~6 The vehicle shall be driven with appropriate accelerator pedal movement to achieve the time-versus-speed relationship prescribed by the driving cycle. If test vehicles are equipped with manual transmission, the transmission shall be shifted in accordance with procedures that are representative of shift patterns that may reasonably be expected to be followed by vehicles in use.

1.4.~~6~~7 If the vehicle has a regenerative braking system, the vehicle shall be tested on the dynamometer with the identical control strategy as used in service. Vehicles equipped with an antilock braking system or traction control system may require modifications (i.e. defeat) to those systems during dynamometer testing to achieve normal operation of the regenerative braking system.

1.4.~~7~~8 ~~If necessary,~~ ~~v~~Vehicles with air suspension ~~may~~ shall be aired up from an external source prior to testing. After the vehicle has reached sufficient air pressure to achieve proper suspension leveling and service brake operation, external air shall be disconnected from the vehicle and shall not be reconnected during emissions testing or between testing events during the key-off period.

1.4.~~8~~9 Off-vehicle charging shall be allowed only for the battery conditioning of charge-sustaining hybrid-electric vehicles ~~HEVs~~.

1.4.10 In the event that the rechargeable energy storage system is damaged or has an energy storage capability below the manufacturer's specified rating, the rechargeable energy storage system shall be repaired or replaced and stabilized, and then the test procedure should be repeated. Data from tests with a faulty rechargeable energy storage system shall be considered invalid.

1.5 Chassis Dynamometer Specifications. The chassis dynamometer shall be capable of mimicking the transient inertial load, aerodynamic drag and rolling resistance associated with normal operations of heavy-duty vehicles. The transient inertial load shall be simulated using appropriately sized flywheels or electronically controlled power absorbers. It is recommended to use a 40 CFR, §1066 compliant chassis dynamometer, if available. The driver shall be provided a

visual display of the desired and actual vehicle speed to allow the driver to operate the vehicle on the prescribed cycle.

1.5.1. Coastdown analysis. The drag and rolling resistance shall be established as a function of vehicle speed as referenced in 40 CFR, §86.1229-85 (October 6, 2000) or another appropriate method approved by the Executive Officer. The vehicle weight for the on-road coastdown shall be the same as the anticipated vehicle testing weight as simulated on the dynamometer. Vehicles equipped with regenerative braking systems that are activated at least in part when the brake pedal is not depressed shall have their regenerative braking systems disabled during the deceleration portion of coastdown testing, preferably through temporary software changes in the vehicle's control system.

1.6 Test Instrumentation. Equipment referenced in 40 CFR, §86.13045-90 (April 11, 1989) to 40 CFR, §86.1326-90 (April 11, 1989) (including exhaust emissions sampling and analytical systems) shall be required for emissions measurements. All instrumentation shall be NIST-traceable (National Institute of Standards and Technology). The following instruments shall be required for as-needed usage:

a) A DC wideband voltage, Ampere, and Watt-hour meter (power analyzer): This is the preferred electrical measurement system when possible since voltage and current of the rechargeable energy storage system are measured directly with this meter. It shall be installed in such a way as to measure all current leaving and entering the rechargeable energy storage system (no other connections upstream of the measurement point). Ampere-hour meters using an integration technique shall have an integration period of less than 0.05 seconds if an integration technique is used, so that abrupt changes of current can be accommodated without introducing significant integration errors. Total accuracy of current measurements shall be 1% of the reading or 1% of full scale, whichever is larger. Instruments shall not be susceptible to offset errors measuring current, because very small current offsets can be integrated throughout the cycle and provide erroneous net energy change results.

b) A DC wideband Ampere-hour meter: If voltage sensing is not available, then one should optionally measure ampere-hours without directly sensing voltage. In this case, the voltage shall be monitored (logged) from vehicle network data or some other means. Good engineering judgment should be used in order to ensure the voltage signal used is representative of the actual battery terminal voltage.

c) An instrument to measure a capacitor's voltage (if applicable).

d) An instrument to measure an electromechanical flywheel's rotational speed (if applicable).

e) An AC Watt-hour meter to measure AC recharge energy (if applicable): It shall be installed in such a way as to measure all AC electrical energy entering the charger. The AC Watt-hour meter shall have a total accuracy of 1% or better. In the event that the AC energy side of a particular charging setup is difficult or impossible to obtain, engineering judgment may be used to provide an estimated correction factor given the measured DC energy into the battery.

f) A voltmeter and ammeter for as-needed usage.

g) A means to verify and record engine operation for the purpose of determining the dynamometer distance traveled before initial engine startup.

h) An instrument to measure throttle or pedal position (or an equivalent indicator of the driver's acceleration demands).

The accuracy of each instrument shall be as specified in 40 CFR, §86.1309-90 and SAE J1634, as applicable. Instrument accuracy for coastdown measurements shall be as specified in SAE J2263 and SAE J2265, as applicable. ~~a DC wideband Ampere-hour meter with an integration period of less than 0.05 seconds if an integration technique is used; an instrument to measure a capacitor's voltage; an instrument to measure an electromechanical flywheel's rotational speed; an AC Watt-hour meter to measure AC Recharge Energy; and a voltmeter and ammeter.~~ As specified in 40 CFR, Part 1065, where applicable, dilution ~~T~~tunnel flow volume shall be set at the minimum level possible for vehicles such that a carbon balance for fuel efficiency and a hydrocarbon balance for tunnel integrity can be performed accurately and the lowest possible detection limits can be determined. Where possible, laboratories shall determine and submit estimated lower detection limits with all test data. The detection limits shall be expressed in the same units as the data (e.g., grams per mile for emission data). The detection limit for a laboratory, based on good engineering judgment, shall be determined by one of two methods. For laboratories with a large base of repeat run data, the measurement error may be determined statistically from run-to-run variations, and the detection limit may be equated to the measurement error. In other cases, the measurement error must be determined by considering the stated accuracy of the analyzers, calibration gases, balance (for PM) and assigning these potential errors as a root-mean-square error to detection limit. These errors must be considered twice, since they are also applied to the background measurement, and introduce error into the background correction. Emission levels that are determined to be below detection limit shall be cited as less than the detection limit value.

2. Chassis Dynamometer Test Procedure

2.1 Vehicle Propulsion System Starting and Restarting. The vehicle's propulsion system shall be started according to the manufacturer's

recommended starting procedures in the owner's manual. Only equipment necessary to the primary propulsion of the vehicle during normal service shall be operated.

2.2 Driving cycles. Chassis testing shall include two separate test cycles as follows: one cold start and three hot start tests using the Orange County bus cycle; and one cold start and three hot start tests using the heavy-duty Urban Dynamometer Driving Schedule (UDDS) (40 CFR, §86 Appendix I(d)) (~~April 29, 1998~~July 13, 2005).

~~**2.2.1 During the interim certification period, the Executive Officer may request data from one cold start and three hot starts using the Central Business District (CBD) cycle which will not be used for certification.**~~

2.2.21 The applicant may request a substitution of one test cycle with one representative of specific ~~transit fleet~~ vocational operation for approval ~~of~~ by the Executive Officer.

2.2.32 The test vehicle shall be operated through at least one preliminary run of the desired test cycles to familiarize the driver with vehicle operation and verify function of laboratory instrumentation.

2.2.43 A cycle length of approximately 30 minutes shall be used for all chassis tests. For driving cycles less than 30 minutes in duration, repetitions of the cycle shall be run back-to-back for a total cycle length of approximately 30 minutes. Chassis tests shall also consist of a normalized condition prior to the test, including either a 12-hour cold soak or a warm-up followed by a 20- to 30-minute key-off period.

~~**2.2.5 If at any point during the test vehicle propulsion is not possible or the driver is warned by the vehicle to discontinue driving because the RESS energy supply is too low, the test shall be considered invalid.**~~

2.3 Charge-Sustaining Vehicle Evaluation Procedure. Reference: SAE J2711, "Recommended Practice for Measuring Energy Consumption of Conventional and Hybrid Heavy-Duty Vehicles Using a Chassis Dynamometer" (Proposed Draft May 2012).

2.4 Charge-Depleting Vehicle Evaluation Procedure (Plug-In Hybrid-Electric Vehicles). Reference: SAE J2711, "Recommended Practice for Measuring Energy Consumption of Conventional and Hybrid Heavy-Duty Vehicles Using a Chassis Dynamometer" (Proposed Draft May 2012).

2.35 Cold and Hot Emission Tests

2.35.1 Cold start test cycles shall include all emission data from the moment the vehicle is started, including the actual start event. The vehicle shall be cold soaked for a minimum of 12 hours at no less than 20 °C (68 °F) and no

greater than 30 °C (86 °F) to ensure that all components are at ambient temperature. The vehicle shall remain in the key-off position for 30 minutes until testing begins. A separate vehicle or other equipment (e.g., electric heaters) as necessary, based on good engineering judgment, shall be utilized to bring the dynamometer to operating temperature, where possible. The vehicle shall be started and idled for one minute, after which time the 30-minute test cycle shall commence. Emission measurements shall be taken from one minute before the vehicle is started through test cycle completion. At the end of the test cycle the vehicle shall be returned to the key-off condition.

2.35.2 Hot test cycles shall include all emission data from the moment the vehicle is started, excluding the actual start event. The vehicle shall be started and warmed to operating temperature utilizing the same test cycle that will be used for emission characterization. Multiple back-to-back hot test events must include a 20- to 30- minute key-off condition in between each test event. Once the vehicle is at operating temperature the vehicle shall be turned off and will remain in the key-off position for approximately 20 to 30 minutes. The vehicle shall be restarted and idled for one minute, at which time the 30-minute test cycle shall begin and emission measurements will be taken. At the end of the test cycle the vehicle shall be returned to the key-off condition.

2.46 Intra-test Pauses. Between two test events, the vehicle shall remain with the key switch in the key-off position for 20 to 30 minutes, with the engine enclosure closed, cooling fans switched off, and the brake pedal not depressed.

2.57 Test Termination. The test shall be terminated at the conclusion of the test run. If necessary, a one-minute idle may be added at the end of the test cycle before termination for collection of emissions remaining in the sampling train.

2.68 Data Recording.

2.68.1 The emissions from the vehicle exhaust shall be ducted to a full-scale dilution tunnel where the gaseous emissions of hydrocarbons, carbon monoxide, oxides of nitrogen (both nitric oxide and nitrogen dioxide) and carbon dioxide shall be measured on a continual basis at a frequency of 5 Hz or greater. An integrated bag sample of the dilution tunnel may be collected and analyzed for carbon monoxide and carbon dioxide levels, and these may be compared to the continuous measurements for carbon monoxide and carbon dioxide as a quality assurance check. Modal results must be within five percent of bag sample results for modal results to be used. Alternatively, the measured values for carbon monoxide and carbon dioxide may be obtained from the integrated bag sample. Particulate matter shall be measured gravimetrically using fluorocarbon-coated glass fiber filters by weighing the filters before and after testing. Filters shall be conditioned to temperature and humidity conditions as specified in 40 CFR, §86.1312-88 (September 5, 1997).

2.~~6~~8.2 For each constituent, a background sample using the same sampling train as used during the emission testing shall be measured before and after the emission test, and the background correction shall be performed as specified by 40 CFR, §86.1343-88 (September 5, 1997). For a compressed natural gas-fueled vehicle, and in cases where non-methane hydrocarbons are a species of interest, the integrated methane and non-methane content of hydrocarbons shall be measured, using gas chromatography analysis of integrated bag samples for each run. If necessary, the tunnel inlet may be filtered for PM with a HEPA filter to aid in lowering the detection limits.

2.~~6~~8.3 Fuel consumed shall be determined by carbon balance from the analytical instruments, and the number of dynamometer roll revolutions shall be used to determine the distance traveled during the driving cycles.

2.~~6~~8.4 ~~SOC~~ State of Charge of the vehicle shall be measured continuously (at a rate of 1Hz or greater) and recorded throughout the entire test. Recorded data shall then be time integrated against the emission measurement data at the beginning and end of the test to coincide with the emission measurement portion of the chassis test. Provided the ~~SOC~~ state of charge is measured, time sequenced and integrated in accordance with the procedures in this document, only the beginning and ending ~~SOC~~ state of charge values are necessary in the final test report. Both Ampere-hours ~~Ah~~ and system voltage shall be recorded during the test, as outlined in the method for determining ~~NEC~~ net energy change.

3. Final Report

3.1 Exhaust Emissions and Fuel Economy. The exhaust emissions and fuel economy of the hybrid-electric vehicle shall be reported in grams per mile and miles per diesel equivalent gallon, respectively. Total fuel energy shall be reported in ~~British Thermal Units~~ (Btu). The total exhaust emissions of the hybrid-electric vehicle shall be reported as the sum of the emissions from the charge-sustaining portion and the emissions from the non-charge-sustaining portion of the full charge test. For the purpose of this section, the "non-charge-sustaining portion of the full charge test" is defined as the sum of the charge-depleting portion of the full charge test and the transition portion of the full charge test.

3.1.1 Calculations for exhaust emissions are referenced in 40 CFR, §86.1342-90 (September 5, 1997) with the following revision to paragraph (a):

$$A_{WM} = (1/7)(Y_C/D_C) + (6/7)(Y_H/D_H)$$

Where:

A_{WM} = Weighted mass emission level for each drive cycle in grams per vehicle mile

Y_C = Mass emissions from the cold start test in grams

Y_H = Averaged mass emissions from the hot start tests in grams

D_C = Measured driving distance from the cold start test in miles

D_H = Averaged measured driving distance from the hot start tests in miles

3.2 Fuel Consumption Calculations. Reference: SAE J2711, "Recommended Practice for Measuring Energy Consumption of Conventional and Hybrid Heavy-Duty Vehicles Using a Chassis Dynamometer" (Proposed Draft May 2012).

3.23 ~~SOC~~ State of Charge Difference. The state of charge difference of the ~~RESS~~ rechargeable energy storage system shall be measured during the test and reported along with the ~~RESS~~ rechargeable energy storage system ~~NEC~~ net energy change.

3.34 Net Energy Change ~~(NEC)~~. ~~NEC~~ Net energy change calculations for batteries, capacitors, and electromechanical flywheels are listed below.

3.34.1 Batteries. Either of two equations may be used to calculate the ~~NEC~~ net energy change for batteries:

(1) **~~NEC~~ Net Energy Change = [~~SOC~~ State of Charge $_{final}$ – ~~SOC~~ State of Charge $_{initial}$] * V_{system} * K_1**

where

~~SOC~~ State of Charge = Battery ~~SOC~~ State of Charge at the beginning and end of the test run, in Ampere-hours ~~(Ah)~~. If the ~~SOC~~ State of Charge $_{final}$ and ~~SOC~~ State of Charge $_{initial}$ values are in ampere-seconds, the conversion factor is not used.

V_{system} = Battery's DC nominal system voltage as specified by the manufacturer, in volts (V)

K1 = Conversion factor = 3600 (seconds/hour; not used if ~~SOC~~ State of Charge $_{final}$ and ~~SOC~~ State of Charge $_{initial}$ values are in ampere-seconds)

or,

(2) **~~NEC~~ Net Energy Change = ~~SOC~~ State of Charge $_{delta}$ * V_{system} * K_1**

where

~~SOC~~ State of Charge $_{delta}$ = ~~Delta~~ Change in Ampere-hours during a test

V_{system} = Battery's DC nominal system voltage as specified by the manufacturer, in ~~volts (V)~~

K_1 = Conversion factor = 3600 (seconds/hour; not used if ~~SOC~~ State of Charge $_{final}$ and ~~SOC~~ State of Charge $_{initial}$ values are in ampere-seconds)

3.34.2 Capacitors. The following equation shall be used to calculates ~~NEC~~ net energy change for capacitors:

~~NEC~~ Net Energy Change = (C/2) * [~~SOC~~ State of Charge $_{final}$ – ~~SOC~~ State of Charge $_{initial}$]

where

~~SOC~~ State of Charge = The capacitor ~~SOC~~ State of Charge at the beginning and end of the test run, in $(V)^2$

C = Rated capacitance of the capacitor as specified by the manufacturer, in Farads (F)

3.34.3 Electromechanical Flywheels. The following equation shall be used to calculate ~~NEC~~ net energy change for electromechanical flywheels:

~~NEC~~ Net Energy Change = (1/2) * I * [~~SOC~~ State of Charge $_{final}$ – ~~SOC~~ State of Charge $_{initial}$] * K_2

where

~~SOC~~ State of Charge = Flywheel state-of-charge at the beginning and end of the test run, in $(rpm)^2$

I = Rated moment of inertia of the flywheel system, in kilogram-$meter^2$ ($kg\text{-}m^2$)

K_2= Conversion factor = $4\ \pi^2/3600$ ($rad^2/sec^2/rpm^2$)

3.45 ~~NEC~~ Net Energy Change Variance Determination.

3.45.1 Total Fuel Energy. Total fuel energy is the energy value of the fuel consumed by the internal combustion engine, hydraulic, turbine, flywheel, or fuel cell during the test and shall be calculated using the following equation:

Total Fuel Energy = NHV_{fuel} * m_{fuel}

where

NHV_{fuel} = Net heating value (per consumable fuel analysis as specified by ASTM) in Joules per kilogram (J/kg)

~~M~~m $_{fuel}$ = Total mass of fuel consumed over test, in kilograms (kg)

~~**3.4.2 Total Cycle Energy.** The total cycle energy shall be reported in watt-seconds or converted to kWh.~~

~~**Total Cycle Energy = Total Fuel Energy – NEC**~~

3.4~~5~~.3~~2~~ Determination Procedure. To determine if a test run has an acceptable ~~NEC~~ net energy change variance, divide ~~NEC~~ net energy change of rechargeable energy storage system by total ~~cycle~~ fuel energy. If the absolute value of the calculation yields a number less than or equal to ~~2~~1%, as shown in the equation below, the ~~NEC~~ net energy change variance is within tolerance levels.

(~~NEC~~ Net Energy Change /t~~T~~otal ~~cycle~~Fuel e~~E~~nergy) * 100% ≤ ~~2~~1%

If the absolute value of the calculation yields a number greater 1%, but less than or equal to 5%, emissions and fuel economy values from the test run need to be corrected for state of charge as described in SAE J2711. Test runs with ~~NEC~~ net energy change variance greater than +/- ~~2~~5% shall be considered invalid.

3.~~5~~6 Final Test Report. The final test report shall include all measured parameters, including vehicle configuration, vehicle statistics, test cycles, measured parameters and calculated test results.

4. Charge-Depleting Hybrid-Electric Vehicles

Modifications to this procedure for measuring fuel economy and emissions of charge-depleting heavy-duty hybrid-electric vehicles may be made upon approval of the Executive Officer.

5. Conventional Drivetrain ~~Urban Transit Buses~~ Vehicles

Modifications to this hybrid-electric drive system procedure for measuring fuel economy and emissions of conventional drivetrain ~~urban transit buses~~ vehicles may be made upon approval of the Executive Officer.

E. Certification by Emission Factor Ratio Application

The applicant shall provide both engine and vehicle test results when using the following procedure. Engine test results shall be obtained from an engine manufacturer who has complied with the HDD TPs, HDO TPs, or alternative procedures approved by the Executive Officer. Vehicle test results shall be obtained from the party certifying the hybrid-electric drive system in accordance with the procedures set forth in ~~S~~section D of this document. An emission factor shall be calculated ~~from~~ using the larger value of two results to determine the

emissions reduction achieved by the hybrid-electric drive system.

1. Emission Factor. An emissions factor shall be calculated by following equation:

$$EF = \frac{\text{Vehicle NOx (g/mi)}}{\text{Engine NOx (g/bhp-hr)}}$$

where

EF = emission factor of the vehicle in bhp-hr/mi

Vehicle NOx = weighted mass emissions level of NOx determined from chassis dynamometer testing in g/mi

Engine NOx = weighted mass emissions level of NOx determined from engine dynamometer testing in g/bhp-hr

Emission factors shall be calculated for ~~HEBs~~ hybrid-electric vehicles and for baseline ~~urban transit buses~~ vehicles. The baseline ~~urban transit bus~~ vehicle shall be selected by the Executive Officer and tested by the Air Resources Board. The resulting data will be available for use by manufacturers applying for certification.

2. Emission Factor Ratio. An emission factor ratio shall be calculated by the following equation:

$$EFR = \frac{EF_{hybrid}}{EF_{baseline}}$$

where

EFR = emission factor ratio

EF_{hybrid} = emission factor calculated for a hybrid-electric ~~urban transit bus~~ vehicle

$EF_{baseline}$ = emission factor calculated for a baseline ~~urban transit bus~~ vehicle

3. Application of Emission Factor Ratio for Hybrid-Electric ~~Bus~~ Vehicle Certification. The NOx certification value for a hybrid-electric ~~bus~~ vehicle shall be calculated by applying the following equation:

~~HEB~~ Hybrid-Electric Vehicle$_{cert}$ = EFR * Engine NOx

where

~~HEB~~ Hybrid-Electric Vehicle$_{cert}$ = hybrid-electric ~~bus~~ vehicles (include

	urban buses) NOx certification value in g/bhp-hr
EFR =	emission factor ratio
Engine NOx =	weighted mass emissions level of NOx determined from engine dynamometer testing in g/bhp-hr

Appendix II - Further Detail on Phase 1 Greenhouse Gas Emission Standards

This appendix provides further detail on the Phase 1 GHG standards. As discussed in Chapter IV.A., each vehicle manufacturer must meet the PUV standards on a fleet average basis for its entire produced fleet. U.S. EPA's PUV vehicle standard is determined by calculating the total average emissions of the produced fleet for a manufacturer, dependent on the work factor (WF) of each individual vehicle family. The WF and design of these vehicles draw upon two key characteristics: payload and towing capabilities. The WF also includes an adjustment for four-wheel drive capability. As explained further in 40 CFR 1037.104 and 1037.150, the target CO2 standards established by U.S. EPA are taken from a set of mathematical functions or curves (CFR, 2013). Beginning with MY 2014 vehicles and increasing in stringency through MY 2019, a unique CO2 target is calculated from each vehicle family's load capacity and production volume. The standards for each manufacturer are then calculated each year, by taking the average of each fleet's total production volume and then multiplying by a unique CO2 target value for that fleet.

Equation II- 1: Proposed Standard for Class 2b and 3 PUVs

$$\text{Fleet-Average Standard} = \frac{\sum[\text{Target}_i \times \text{Volume}_i]}{\sum[\text{Volume}_i]}$$

Within this regulatory vehicle class, U.S. EPA has created separate CO2 standard formulas for diesel and gasoline heavy-duty PUVs. Electric vehicles, fuel cell vehicles, and vehicles that operate without engines are treated as compression-ignition vehicles. The following are the CO2 target calculations for spark-ignition PUVs and compression-ignition PUVs:

Equation II- 2: Proposed Target Standard for Spark-Ignition Vehicles

$$\text{CO2 Target (g/mile)} = 0.0440 \cdot \text{WF} + 339$$

Equation II- 3: Proposed Target Standard for Compression-Ignition Vehicles and Vehicles that Operate Without Engines

$$\text{CO2 Target (g/mile)} = 0.0416 \cdot \text{WF} + 320$$

Manufacturers have two phase-in options for meeting the targets shown in Equation II-2 and Equation II- 3: Phase-In Option A and Phase-In Option B. Once a manufacturer chooses Phase-In Option A or B, it must continue with that option. As referenced in 40 CFR 1037:150, Phase-In Option A begins with 2014 MY vehicles and gradually increases each year in stringency through the 2018 MY (CFR, 2013).
Table II- 1: Proposed Phase-In Option A Standards for Diesel PUVs
and Table II- 2 below outline the proposed Phase-In Option A CO2 standards for diesel and gasoline PUV fleets, respectively.

Table II- 1: Proposed Phase-In Option A Standards for Diesel PUVs

Option A Phase-In Provisions for Diesel Fleet-Average CO_2 Target	
Vehicle MY	Option A CO_2 target (g/mile)
2014	[0.0478 × (WF)] + 368
2015	[0.0474 × (WF)] + 366
2016	[0.0460 × (WF)] + 354
2017	[0.0445 × (WF)] + 343
2018 and subsequent	[0.0416 × (WF)] + 320

Table II- 2: Proposed Phase-In Option A Standards for Gasoline PUVs

Option A Phase-In Provisions for Otto-Cycle Fleet-Average CO_2 Target	
Vehicle MY	Option A CO_2 target (g/mile)
2014	[0.0482 × (WF)] + 371
2015	[0.0479 × (WF)] + 369
2016	[0.0469 × (WF)] + 362
2017	[0.0460 × (WF)] + 354
2018 and subsequent	[0.0440 × (WF)] + 339

Phase-In Option B matches Phase-In Option A CO2 target values for MYs 2014 and 2015, but is more stringent for MY 2016 and 2017 but less stringent for M2018, as shown in Table II- 3 and Table II- 4.

Table II- 3: Proposed Phase-In Option A Standards for Diesel PUVs

Option B Phase-In Provisions for Diesel Fleet-Average CO_2 Target	
Vehicle MY	Option B CO_2 target (g/mile)
2014	[0.0478 × (WF)] + 368
2015	[0.0474 × (WF)] + 366
2016 – 2018	[0.0440 × (WF)] + 339
2019 and subsequent	[0.0416 × (WF)] + 320

Table II- 4: Proposed Phase-In Option B Standards for Gasoline PUVs

Option B Phase-In Provisions for Otto-Cycle Fleet-Average CO_2 Target	
Vehicle MY	Option B CO_2 target (g/mile)
2014	[0.0482 × (WF)] + 371
2015	[0.0479 × (WF)] + 369
2016–2018	[0.0456 × (WF)] + 352
2019 and subsequent	[0.0440 × (WF)] + 339

1. **Alternate Phase-In Standards for Medium- and Heavy-Duty Diesel Engines**

As described in 40 CFR 1036.150(e), the federal Phase 1 program provides added flexibility for manufacturers of diesel engines, looking to align their technology changes with multiple regulatory requirements (CFR, 2013). For VV manufacturers, an "OBD phase-in" option was specifically requested for meeting heavy-duty diesel engine standards so that manufacturers could combine design changes where possible to meet OBD and GHG requirements (U.S. EPA, 2011b). The same flexibility was also extended to manufacturers of heavy-duty diesel engines for use in tractor-trailers to alleviate compliance burden. As summarized in

below, staff is proposing to adopt the federal Phase 1's Alternate Phase-In Standards, also known as the "OBD phase-in" option, which allows manufacturers to reduce the resources needed for new product designs and certification (ibid). For this alternate phase-in option, manufacturers must certify all of their MY 2013 diesel engines and continue using this option through the 2016 MY. Compared to the primary phase-in option, this option requires engines built in MYs 2013 and 2016 to achieve greater reductions, and requires fewer reductions for engines built in 2014 and 2015. By 2017, manufacturers must meet the requirements in the proposed Primary Phase-In Option Standards. Manufacturers must designate the engines for a specific intended service class—VV class or tractor-trailer class—and cannot opt out of the standards once certified. As explained in 40 CFR 1036.108(e), engines certified to these alternate standards are fixed to the primary intended service class, and these engines are not eligible for early credits (CFR, 2013). Staff proposal would maintain the same compliance requirements as outlined in the federal Phase 1 program when allowing manufacturers to certify to this alternate phase-in standard.

Table II- 5: Proposed Alternate Phase-In CO2 Emission Engine Standards

Alternate Phase-in CO_2 Emission Standards (in g/bhp-hr)					
	LHD – vocational	MHD – vocational	HHD – vocational	MHD – tractor	HHD – tractor
2013-2015	618	618	577	512	485
2016 and later	576	576	555	487	460

2. **Alternate Emission Standards Based on 2011 MY Engines**
Some 2011 MY engines may have higher emissions than the 2010 baseline level, due to various factors including criteria pollution control devices, unique engine calibrations, or duty cycle differences (U.S. EPA, 2011b). Therefore, the federal Phase 1 program allows manufacturers to use an optional, alternate emission standard program to certify their engines during the 2014 to 2016 time frame using a 2011 engine as the baseline for emissions (ibid). Manufacturers using this option for MYs 2014 to 2016 will need to make a greater relative improvement for MY 2017 engines, compared to the rest of the industry, since the starting emissions level will be higher. A manufacturer can only opt into this alternate emission standard program if all credit opportunities are exhausted, and if the manufacturer cannot meet the primary standards. Staff is proposing to adopt the federal Phase 1 alternate emission standard program to allow for identical compliance strategies with the Phase 1 program. The alternate standards referenced in 40 CFR 1036.620 are determined by measuring the emission rate of the test engine of the applicable baseline 2011 engine family and then multiplying by a percent emissions reduction value (CFR, 2013). The alternate CO2 standard for LHD and MHD vocational-certified engines is equal to the baseline 2011 emission rate multiplied by 0.975. The alternate CO2 standard for tractor-certified engines and all other heavy-duty engines is equal to the baseline 2011 emission rate multiplied by 0.970. To minimize the risk of unfair certification practices, where a manufacturer could establish an unreasonably high 2011 baseline emission level, the federal Phase 1 program is requiring that the 2011 MY baseline be determined either by averaging emissions over all engines in an engine averaging set, certified and sold during 2011 or meet additional criteria in 40 CFR 1036.620 and 49 CFR 535.5(d) (CFR, 2013; U.S. EPA, 2011b).

A. Maintenance Requirements/In-Use Standards

i. Manufacturer Maintenance Requirements

Staff is proposing to align California's maintenance requirements with the Phase 1 program requirements for manufacturers. The Phase 1 program requires vehicle manufacturers to submit detailed maintenance schedules with their certification application. This maintenance schedule should include instructions on lubricant replacement, fairing adjustments, periodic

inspections of aerodynamics, and other operations that ensure products maintain compliance with emissions standards through the useful life of the vehicle (U.S. EPA, 2011b). The federal program also expects manufacturers to ensure that critical emission-related maintenance is performed. Manufacturers can accomplish this supplemental maintenance by submitting survey data that shows at least 80% of their engines receive the required in-use maintenance or by providing critical emission-related maintenance at no cost to the user (ibid). The federal program also requires vehicle manufacturers to include detailed information in the owner's manual to instruct owner/operators on how to replace LRR tires with tires performing equal to or better than the original tires (ibid). However, while tire replacement instructions must be provided in the owner's manual, vehicle manufacturers are not directly responsible for ensuring owner/operators replace original tires with LRR tires.

ii. Owner/Operator Maintenance Requirements

Staff is also proposing to align with federal maintenance requirements for owners/operators. As stated in 40 CFR 1037.655, the federal Phase 1 program prohibits any person from removing or rendering inoperative any emission control device. Vehicle owners are expected to maintain installed vehicle equipment, and modifications must be done on a reasonable technical basis that does not result in increased emissions of any regulated pollutant (CFR, 2013).

iii. Vehicle Warranty

Staff's proposal would maintain the same vehicle warranty requirements as those established by the federal Phase 1 program. At the time of certification, the federal program requires manufacturers to submit a copy of a vehicle's warranty statement. GHG emission-related components are to be covered under the vehicle warranty. The federal Phase 1 program also requires manufacturers to design and build products that comply with emissions requirements at the time of sale. The warranty period is dependent on the type of vehicle certified. Gasoline and light heavy-duty diesel vehicles have a warranty of 5 years or 50,000 miles, whichever comes first. Medium- and heavy heavy-duty diesel vehicles have a warranty period of 5 years or 100,000 miles, whichever comes first. In addition, tires must be free from defects for two years or 24,000 miles, whichever comes first. Vehicle manufacturers must describe emissions related warranty agreements in the owner's manual.

iv. In-Use Vehicle Standards

The federal Phase 1 program requires vehicles to meet in-use emissions standards throughout the useful life of the vehicle. Staff is proposing to adopt identical useful life requirements for vehicle manufacturers to remain consistent with federal in-use compliance periods as shown in Table II- 7 below. The useful life of a vehicle can be expressed in miles or years,

whichever comes first. The useful life of a vehicle varies, depending on the vehicle type and the GVWR of the vehicle.

Table II- 6: In-Use Performance Vehicle Standards

Vehicle Type	GVWR	Useful Life: Miles or Years (whichever comes first)	
Pickup Trucks & Vans (PUVs)	8,501 pounds -14,000 pounds	120,000 miles	11 years
Vocational Vehicles (VVs)	≤19,500 pounds	110,000 miles	10 years
	19,500 pounds-33,000 pounds	185,000 miles	10 years
	>33,000 pounds	435,000 miles	10 years
Tractor-Trailers	26,000 pounds-33,000 pounds	185,000 miles	10 years
	>33,000 pounds	435,000 miles	10 years

v. In-Use Engine Standards

The federal Phase 1 program requires engines to remain in compliance with CO2 emissions standards throughout the useful life of the engine. Staff is proposing to adopt identical useful life requirements for engine manufacturers to remain consistent with in-use compliance periods as shown in Table II- 7 below. For engines, useful life values are the same as those applicable to criteria air pollutants.

Table II- 7: In-Use Performance Engine Standards

GVWR	Useful life: Miles or Years (whichever comes first)	
≤19,500 pounds	110,000 miles	10 years
19,501 pounds-33,000 pounds	185,000 miles	10 years
>33,000 pounds	435,000 miles	10 years

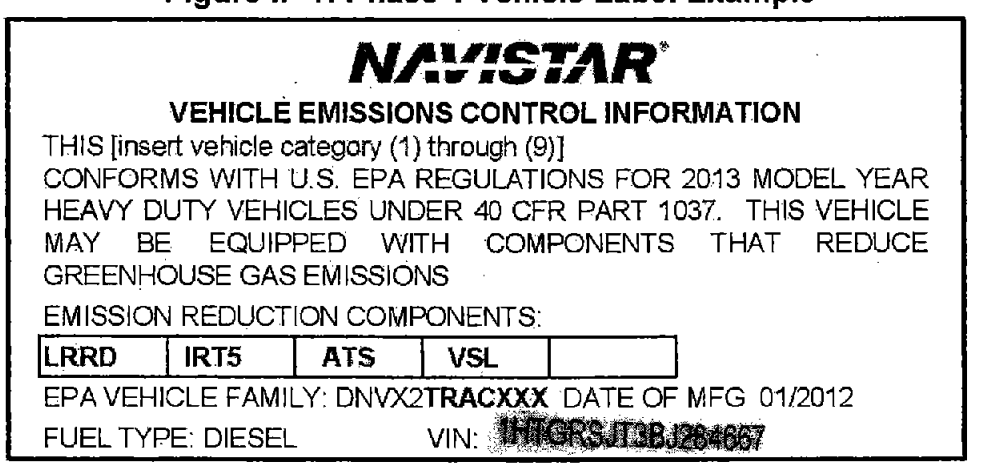
For in-use engine standards, the family emission limit (FEL) serves as the primary emission standard for engine family testing, excluding certification and confirmatory testing. Family certification limits (FCLs) are used to calculate the FEL value. As explained in 40 CFR1036.108, the CO2 FEL is calculated by multiplying the FCL by 1.03 (CFR, 2013). Finally, the federal Phase 1 program creates a separate adjustment factor to calculate in-use standards unique to heavy-duty PUV vehicles (U.S. EPA, 2011b). The federal Phase 1 program's intent for this adjustment factor was to provide a reasonable margin for production and testing variability from initial and in-use testing results. Staff is proposing to adopt identical useful life periods and in-use standard calculations to align with federal requirements.

vi. Vehicle Labels

The federal Phase 1 standards establish vehicle labeling requirements for medium- and heavy-duty vehicles as verification that vehicles meet required GHG emission standards. Similar to the emission control labels found on

engines, the vehicle labels include a heading, corporate name and trademark, vehicle family name, regulatory subcategory, date of manufacture, emission control system, fuel and lubricant requirements, and a compliance statement (U.S. EPA, 2011b). The vehicle labels must also include a list of installed emission control devices to help enforcement staff verify that necessary components are installed by manufacturers, as originally submitted during the certification process (U.S. EPA, 2011b). Emission reduction components include idle reduction technologies, LRR tires, vehicle speed limiters, vehicles with hybrid powertrains, or other advanced or innovative technologies present on the vehicle. The complete list of emission control identifiers for the labels can be found in Appendix 3 of 40 CFR 1037 (CFR, 2013). Vehicle manufacturers meeting the small business criteria for truck manufacturing are exempt from the regulation and must label any exempt vehicles with the following statement: "THIS VEHICLE IS EXCLUDED UNDER 40 CFR 1037.150(c)." An example of a Phase 1 vehicle label is shown as Figure II- 1 below.

Figure II- 1: Phase 1 Vehicle Label Example


NAVISTAR®

VEHICLE EMISSIONS CONTROL INFORMATION

THIS [insert vehicle category (1) through (9)]
CONFORMS WITH U.S. EPA REGULATIONS FOR 2013 MODEL YEAR HEAVY DUTY VEHICLES UNDER 40 CFR PART 1037. THIS VEHICLE MAY BE EQUIPPED WITH COMPONENTS THAT REDUCE GREENHOUSE GAS EMISSIONS

EMISSION REDUCTION COMPONENTS:

LRRD	IRT5	ATS	VSL	

EPA VEHICLE FAMILY: DNVX2**TRACXXX** DATE OF MFG 01/2012

FUEL TYPE: DIESEL VIN: 1HTGRSJT3BJ284667

Staff is proposing to largely align California's vehicle labeling requirements with the federal Phase 1 program's requirements.

vii. Engine Labels

The federal Phase 1 program has additional labeling requirements for new heavy-duty engines meeting GHG standards. As specified in 40 CFR 86.095, the Phase 1 program requires emission control labels, stating that engines meet both criteria and GHG emission standards, to be attached to a permanent engine part (CFR, 2013). Engine labels are to include a heading, the full corporate name and trademark, engine family and model designations, compliance statement, engine specifications and recommended adjustments. As specified in 40 CFR 1036.135, the labels must identify emission control systems and any limitations on certification (CFR, 2013). Specifically, the label will need to indicate whether the engine is certified for use in VVs, tractor-trailers, or both. For example, if a manufacturer certifies

HHD engines to the CO2 standards using only the transient cycle testing, they would include the statement "VOCATIONAL VEHICLES ONLY." Diesel engines that use the averaging, banking, and trading (ABT) credit program must also include the FEL to which the engine is certified. Heavy-duty engine manufacturers that qualify for the small manufacturer provision (discussed below) must label their exempt engines with a label that includes the following statement: "THIS ENGINE IS EXCLUDED UNDER 40 CFR 1036.150(d)." Engines certified to the alternate engine standard will need to include a label with the following compliance statement: "THIS ENGINE WAS CERTIFIED TO THE ALTERNATE GREENHOUSE GAS EMISSION STANDARDS OF 40 CFR 1036.108(a)(4)." Staff is intending to align California requirements with federal engine labeling requirements.

B. Exemptions

Staff is proposing to retain the same exemptions as allowed by the federal Phase 1 program. Small business engine and vehicle manufacturers that meet the small business size criteria are exempt from the requirements of the Phase 1 program (CFR, 2013). Currently, the Small Business Administration defines a small business for heavy-duty vehicle manufacturing and engine manufacturing as 1,000 employees and 750 employees, respectively. Qualifying entities will need to submit a written declaration as outlined in the reporting section of the proposal.

In addition, Class 7 and 8 heavy-duty vehicles that operate off-road are exempt from the tractor-trailer standards (U.S. EPA, 2011b). However, standards would still apply to the engines in these vehicles. Small volume manufacturers who produce combined U.S. sales of fewer than 10,000 units may follow special certification procedures described in 40 CFR 86.098-14(b) (CFR, 2013).

C. Reporting and Recordkeeping Requirements

The federal Phase 1 program requires engine manufacturers to submit end-of-year reports as part of completing the certification process to approve federal engine use and sale. Engine manufacturers must submit end-of-year reports (U.S. EPA, 2011b) pertaining to:

- engine family designation and averaging set;
- engine emissions and fuel consumption standards including any alternative standards used;
- engine family FCLs;
- final production volumes;
- certified test cycles;
- useful life values for engine families; and
- a credit plan identifying the manufacturer's actual credit balances, flexibilities, trades, and credit deficit plan.

Vehicle manufacturers must submit annual reports (U.S. EPA, 2011b) including:

- vehicle family FELs;
- final production volumes;
- vehicle family designation and averaging set data;
- vehicle emissions standards including any alternative standards used;
- certified test cycles;
- useful life values for vehicle families;
- a plan describing any exempt vehicles for off-road or small business purposes; and
- a credit plan identifying the manufacturer's actual credit balances, flexibilities, trades, and credit deficit plan.

To minimize the costs associated with reporting and to reduce any unnecessary burden, staff is proposing that engine and vehicle manufacturers be required to submit 2 copies of the final reports submitted to U.S. EPA to ARB's Certification Section as well. Staff is proposing that manufacturers submit final reports within 90 days after the end of the MY, as required in 40 CFR 1036.250 and 1037.250 (CFR, 2013). Since the proposed regulation will take effect only after the Office of Administrative Law has approved the proposal (expected in late 2014), engine and vehicle manufacturers may need to submit reports for any affected MYs after the 90-day period; staff intends to issue an advisory to clarify the deadline by which 2013 and 2014 final reports are due to ARB's Certification Section.

As further described in 40 CFR 1036.735 and 1037.735, engine and vehicle manufacturers are required to keep records for at least eight years after the due date for the end-of-year report (CFR, 2013). Engine or vehicle credits will not be recognized by U.S. EPA if the records are not kept on file as required. The records can be kept in any format on any media, and must be readily available in English if U.S. EPA requests them at any time. Staff is proposing to adopt the same Phase 1 recordkeeping requirements for both engine and vehicle manufacturers.

D. Test Procedures and Certification Process

This section includes a discussion of the test procedures and vehicle simulation model mandated for use to show compliance with the Phase 1 standards, as well as a discussion of how the certification process would work for manufacturers that apply for U.S. EPA certification and then wish to be "deemed to comply" for California purposes.

i. Test Procedures

The proposed Phase 1 test procedures for heavy-duty engines and vehicles are outlined below.

1. Engines

Manufacturers must demonstrate compliance with the federal Phase 1 heavy-duty engine standards using the following two test procedures: the "California Exhaust Emission Standards and Test Procedures for 2004

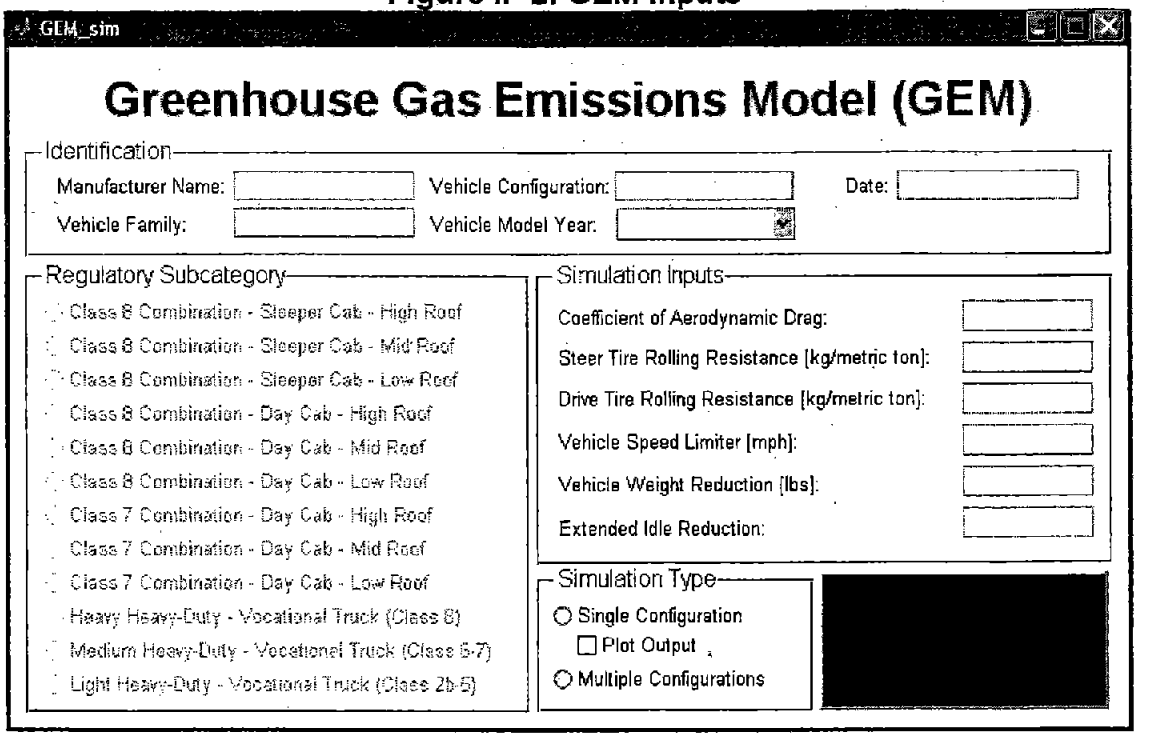
and Subsequent Model Heavy-Duty Diesel Engines and Vehicles" as last amended [April 18, 2013] and the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines" as last amended [April 18, 2013] (U.S. EPA, 2011a). These two test procedures are proposed to be amended to incorporate the federal certification requirements for the control of GHG emissions from heavy-duty engines, Subparts A through I, Part 1036, Title 40, CFR, which specify the certification GHG emission standards, engine family certification process, in-use and certification test procedures, special compliance provisions, and ABT provisions for Phase 1 (CFR, 2013). By utilizing the two test procedures above, manufacturers are able to comply with both federal and California certification requirements.

2. **Vehicles**
   Manufacturers must demonstrate compliance with the Phase 1 vehicle standards using the proposed new "California Greenhouse Gas Exhaust Emission Standards and Test Procedures for 2014 and Subsequent Model Heavy-Duty Vehicles." (HDV TPs) These proposed test procedures specify GHG emission standards, requirements to certify vehicle families, in-use testing provisions, test and modeling procedures, special compliance procedures, and ABT provisions. They also incorporate the federal requirements for the control of GHG emissions from heavy-duty vehicles. Similar to the proposed test procedures described above, the federal requirements specify the GHG emission certification standards, vehicle family certification process, in-use and certification test procedures (such as fuel and dynamometer specifications), special compliance provisions, and ABT provisions. By complying with the proposed new test procedure above, manufacturers are able to comply with the federal and California certification requirements simultaneously.

ii. Greenhouse Gas Emissions Model (GEM)

Compliance with the standards for tractor-trailers and VVs, shown above in Table II- 6 and Table II- 7, respectively, will be determined by the GEM customized vehicle simulation model used by the U.S. EPA (U.S. EPA, 2013a; U.S. EPA, 2013b). This compliance model will substitute for the standard method of chassis dynamometer testing. GEM takes various measurements of vehicle characteristics and uses these measurements as inputs, as shown in Figure II- 2 below.

Figure II- 2: GEM Inputs

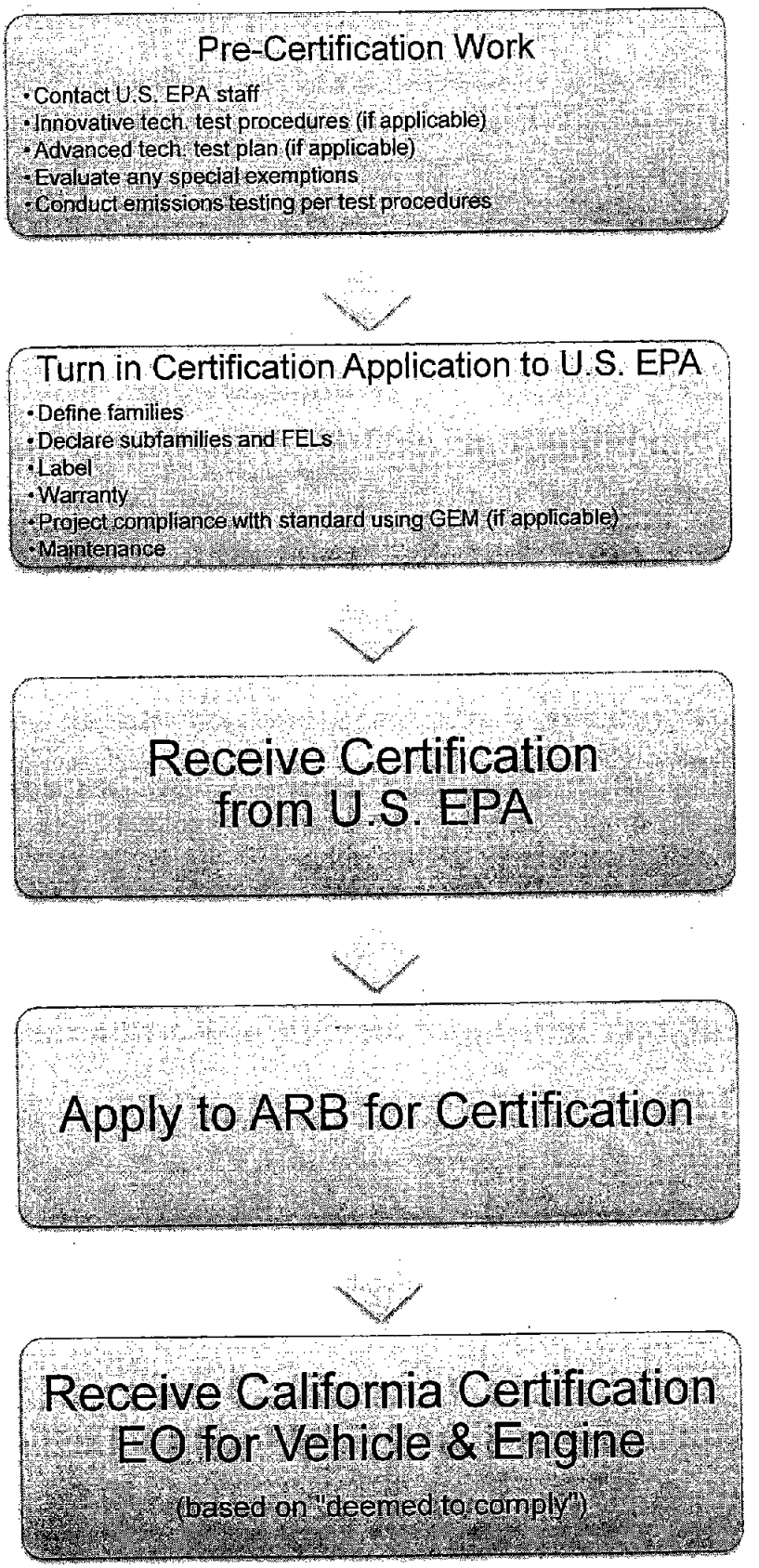


The inputs capture key emissions reduction technologies appropriate for the vehicle type—including coefficient of drag, tire rolling resistance coefficient, weight reduction, idling reduction strategies, and vehicle speed limiters. Based on the inputs, GEM will calculate the expected GHG emissions and fuel efficiency performance of the vehicle with respect to drive cycle in terms of weighted grams of CO2 per ton-mile and gallons per 1,000 ton-miles.

iii. Compliance Process

To comply with California's Phase 1 requirements using "deemed to comply," manufacturers must follow the steps outlined in the flow chart in Figure II- 3 below.

Figure II- 3: Phase 1 Certification Process with "Deemed to Comply" Provisions



E. Compliance Flexibility-Credits

The federal Phase 1 program recognizes the need to provide compliance flexibility in order to set stringent CO2 standards that would reduce emissions at a reasonable rate (U.S. EPA, 2011b). Also, to accommodate any technology feasibility issues and the short lead time for manufacturers, the federal Phase 1 program creates an ABT program and other flexibility provisions including early credits, innovative technology credits, and advanced technology credits to help manufacturers meet CO2 standards. The ABT program allows a manufacturer to exercise maximum flexibility in redesigning and planning where and how to achieve emission reductions with credit options (U.S. EPA, 2011b). There is also a low N2O credit program that allows manufacturers to generate CO2 credits if they are able to employ GHG emission reduction technologies that reduce N2O levels beyond the 2010 baseline. Because staff is proposing the same CO2 standards as in the federal Phase 1 program, even though ARB's regulations will take effect after implementation of the federal Phase 1 program has begun, staff is proposing to adopt the federal CO2 credit programs and flexibilities in their entirety, as well as the federal N2O credit program, so that engine and vehicle manufacturers can use harmonized compliance strategies to meet both the federal and proposed California GHG requirements. A manufacturer using compliance flexibilities or meeting alternate standards to be in compliance with the federal Phase 1 program will be "deemed to comply" with California's proposed Phase 1 regulations as well.

i. Early Credits

The federal Phase 1 program provides an early credit program as an incentive for manufacturers to take early action (U.S. EPA, 2011b). A manufacturer is eligible for early credits if they can certify their entire subcategory of engines or vehicles at GHG emissions below the established primary standards. The federal program uses a 1.5 multiplier for early credits earned with MY 2013 diesel engines and diesel and gasoline vehicles, and 2015 gasoline engines. Manufacturers may not apply both the early credit multiplier and the advanced technology multiplier to the same vehicles (ibid).

A tractor manufacturer may apply for early credits if they are able to sell more 2013 MY SmartWay designated tractors than the number of SmartWay designated tractors sold in MY 2012. Any additional 2013 MY SmartWay designated tractors sold determines the number of tractors eligible for early credit certification. The tractor manufacturer would then need to determine each tractor's 2013 emission performance by using the GEM to calculate the difference between the 2013 performance level and the 2014 MY standard for the appropriate regulatory subcategory (e.g. Class 8 sleeper cab high roof tractors) to determine the amount of eligible early credits (U.S. EPA, 2011b). For PUV manufacturers, the federal Phase 1 early credit program compares

the manufacturer's 2013 heavy-duty PUV fleet with the 2014 fleet-wide targets. The PUV early credit program requires a manufacturer to certify an entire heavy-duty PUV fleet in MY 2013.

ii. Advanced Technology Credits

In order to promote the use of advanced technologies that are not yet commercially available, the federal Phase 1 program creates the advanced technology credit program so that manufacturers will incorporate these technologies in their engine or vehicle designs (U.S. EPA, 2011b). Eligible technologies include hybrid powertrain designs with energy storage systems, Rankine cycle engines with a waste heat recovery system, all-electric vehicles, and fuel cell vehicles. Advanced technology credits are treated differently than any of the other credit programs (e.g. ABT, early credits, or innovative technology credits); these credits can be applied across the entire heavy-duty engine or vehicle sector, and do not need to be kept within an averaging set or subcategory. A manufacturer generating advanced technology credits can apply the credits to any heavy-duty vehicle or engine and is not limited to the vehicle or engine category generating the credit. The federal Phase 1 program establishes a 1.5 multiplier for a manufacturer that accrues advanced technology credits, but also sets a cap of 60,000 megagrams for the amount of advanced credits that can be used by any averaging set for any MY to prevent market distortions (U.S. EPA, 2011b).

Heavy-duty PUVs, all-electric, and other zero tailpipe emission vehicles produced before the 2014 MY are acknowledged for advanced technology credits that can be used to meet 2014 and later fleet target standards, provided that the vehicles are certified to meet the criteria pollutant standards (U.S. EPA, 2011b). The credits for PUVs ware calculated based on the 2014 diesel standard targets, and treated as though they were earned in 2014 with a credit lifespan of five years. PUV manufacturers will not need to early-certify their entire fleet in a given MY, as they would for early credits. MY 2014 and later electric vehicles and other zero emission vehicles could be factored into or taken out of the fleet average GHG calculations based on the diesel standard targets for their MY and WF. The federal Phase 1 program establishes that advanced technology credits for electric and zero-emission vehicles will be exclusively based on a zero emissions tailpipe performance (ibid). The federal program has not finalized a sales cap for the use of electric vehicle technology for PUV vehicles in the 2014 to 2018 MYs since U.S. EPA estimates that introduction of EV technology in this sector will be limited and infrequent (U.S. EPA, 2011b).

iii. Innovative Technology Credits

Acknowledging that emissions reductions may occur off-cycle, the federal Phase 1 program has created an innovative technology credit program to acknowledge reductions not captured over the Federal Test Procedures (FTP) or Supplemental Emission Test (SET) procedures, including the GEM,

used to determine compliance with the CO2 emission standards (U.S. EPA, 2011b). Eligible innovative technologies are those that are newly introduced in one or more engine or vehicle models, but not yet widely implemented in the manufacturer's fleet or averaging set for which the credit is generated (ibid). Such technologies resulting in innovative technology credits include predictive cruise control, gear-down protection, engine cooling strategies, advanced drivelines, light-weight components, active aerodynamic features, and adjustable ride heights. Innovative technologies can be known in the heavy-duty market sector, but must not yet be widely utilized in any particular engine or vehicle subcategory. Credit for tailpipe a/c emissions reductions as opposed to a/c leakage can be obtained through this innovative technology credit program (U.S. EPA, 2011b). Advanced transmissions and drivetrains are also eligible for credits in this program. The federal Phase 1 program has also designated the innovative technology program to allow manufacturers who want to certify hybrid vehicles on a different test cycle than the prescribed cycles as described in 40 CFR 1036.525 (CFR, 2013). Credits obtained for certified hybrid vehicles will be tested through the guidelines set by the Innovative Technology Credit Program, but will be acknowledged as advanced technology credits so that manufacturers can apply such credits across vehicle and engine categories (ibid).

As determined in 40 CFR 1037.610, innovative technology credits that apply to medium- and heavy-duty engines, as compared to vehicles, are separated by application based on the method selected by the manufacturer to determine the amount of emissions reduction achieved from the technology (CFR, 2013; U.S. EPA, 2011b). For example, improvements using chassis dynamometer testing or on-road tests will be considered vehicle credits, and any engine improvements demonstrated by engine dynamometer or powerpack testing will be applied as engine credits (ibid). The federal Phase 1 program recognizes that some exceptions to the application of innovative technology credits may apply, and has created a public evaluation process request a change in credit allocation. To maintain harmonization, ARB proposes to recognize the results of this federal evaluation process.

iv. ABT Credits

Averaging is defined in the federal Phase 1 program as the exchange of emission credits between engine families or truck families within a given manufacturer's regulatory subcategories and averaging sets (U.S. EPA, 2011b). The averaging concept of this credit program allows manufacturers to certify one or more engine or vehicle families within the same averaging set at levels worse than the applicable emission standard. Of course, the increased emissions from the engine or vehicle families within a manufacturer's averaging set would need to be offset by a certified engine or vehicle with better emissions so that the average emissions from all of the manufacturer's engine or vehicle families would be below or equal to the level of the applicable emission standard. Banking is defined as the retention of

emission credits by the manufacturer for use in future MY averaging or trading. Trading is defined as the exchange of emission credits between manufacturers, which are then used for averaging or banking purposes, or trading with another manufacturer (ibid).

Staff is proposing to adopt identical ABT program guidelines and restrictions as established by the federal Phase 1 program. As allowed in the current heavy-duty ABT engine program for criteria pollutants, manufacturers are restricted to ABT credits within a regulatory subcategory. For engines and vehicles, the federal program allows credit averaging within and across vocational and tractor subcategories within the same weight class groups: LHD, MHD, and HHD (U.S. EPA, 2011b). For the PUVs category, the federal program has defined only one averaging set or subcategory since the CO2 standard applies to the entire vehicle.

Under the ABT credit program, while credits can be retained by a manufacturer for a period of up to five years, manufacturers can carry forward credit deficits for up to three years before reconciling any shortfall. However, a manufacturer must use or reconcile any credit deficits before acquiring any banked and traded credits for additional MYs (U.S. EPA, 2011b).

v. **N2O Credits for Engine Manufacturers**

To encourage N2O reductions, engine manufacturers are encouraged to redesign emission control systems and receive credits for very low N2O emission certification levels. If a manufacturer is able to meet the 0.04 g/bhp-hr level for generating N2O credits, which is significantly less than the established N2O engine standard of 0.10 g/bhp-hr, a manufacturer could generate 2.98 grams of CO2 credit for every 0.01 grams of N2O reduced. The federal Phase 1 program created the N2O credit program to ensure that CO2 credits generated would result in significant N2O emission reductions beyond the 2010 baseline performance level. Manufacturers can apply for N2O credits within engine MYs 2014 to 2016 only.

Appendix III – Emissions Inventory Analysis and Results

Air Resources Board (ARB) staff estimates that by 2020, heavy-duty trucks and buses exceeding 8,500 pounds gross vehicle rated weight (GVWR), will be responsible for about 30% of the total on-road statewide greenhouse gas (GHG) emissions and 70% of the total on-road statewide NOx emissions (EMFAC2011). ARB has developed and is implementing a comprehensive regulatory program to reduce these emissions. This Appendix provides an overview to calculations of emissions benefits for several regulations and regulatory amendments designed to achieve these emissions reductions. The first two sections in this appendix describe emissions benefits for two regulations designed to reduce GHG emissions from the heavy-duty fleet. The third section discusses the potential impact of proposed optional lower NOx emissions standards on the statewide NOx emissions inventory.

1. Emissions Benefits: ARB Tractor-Trailer GHG Regulation

1.1. Overview of Regulation

In 2008, ARB adopted a regulation designed to accelerate the use of low rolling resistance tires and aerodynamic fairings to reduce GHG emissions in the heavy-duty truck fleet.

1.1.1. Tractor Requirements

The regulation applies to owners of Class 7 and 8 heavy-duty tractors (>26,000 pounds GVWR) operating on California highways. The regulation includes the following requirements for tractors:

- 2011 and newer model year (MY) sleeper-cab tractors that pull affected trailers in California must be SmartWay certified beginning January 1, 2010.
- 2011 and newer MY day-cab tractors that pull affected trailers in California must use SmartWay verified low rolling resistance tires beginning January 1, 2010.
- All 2010 and older MY tractors that pull affected trailers in California must use SmartWay verified low rolling resistance tires beginning January 1, 2013.

This regulation offers special exemptions for local- and short-haul tractors. A registered local-haul tractor is exempt from the aerodynamic requirements of this regulation, but not from the low rolling resistance tire requirements. An affected short-haul tractor is exempt from all the requirements of this regulation when registered with ARB and updated on an annual basis.

1.1.2. Trailer Requirements

The regulation also applies to owners of 53-foot or longer box-type trailers, including both dry-van and refrigerated-van trailers. The regulation includes the following requirements for trailers:

- 2011 and newer MY 53-foot or longer box-type trailers must, beginning January 1, 2010, be either:
  - SmartWay certified or
  - Retrofitted with SmartWay verified technologies, as follows:
    - Low rolling resistance tires, and
    - Aerodynamic devices
- 2010 and older MY 53-foot or longer box-type trailers (with the exception of certain 2003 to 2009 MY refrigerated-van trailers) must meet the same aerodynamic device requirements as 2011 and newer MY trailers either:
  - By January 1, 2013, or
  - According to a compliance schedule based on fleet size which allows them to phase-in their compliance over time.
- 2010 and older MY trailers must use SmartWay verified low rolling resistance tires by January 1, 2017.
- 2003 to 2009 MY refrigerated-van trailers equipped with 2003 or newer MY transport refrigeration units have a compliance phase-in between 2017 and 2019.

This regulation offers special compliance options for pre-2011 model year trailers. While all 2011 and newer model year trailers must comply as of January 1, 2010 with both the aerodynamic device requirements and low-rolling resistance tire requirements, small fleets (less than 20 trailers) and large fleets (21 or more trailers) can choose to phase-in compliance of their 2010 and older model year trailers for the aerodynamic technology requirements of the regulation.

1.2. Emissions Inventory Methods

Staff used EMFAC2011 and the 2008 staff report as the starting point for this analysis. Based on previous staff analysis and the Tractor-Trailer GHG Reporting database (TRUCRS), staff estimated CO_2 emissions rate reductions under different combinations of calendar year, model year, tractor cab type, trailer van type, haul type, and trailer phase-in options. Previous staff analysis indicated tire improvements lead to a 1.5% reduction in GHG emissions. This same analysis also indicated that the aerodynamic improvements lead to 2%, 4%, and 5% reduction in GHG emissions on tractors, refrigerated vans, and dry vans respectively. The detailed documentation for this analysis can be found in Appendix G, of the "Staff Report: *Initial Statement of Reasons*

for Proposed Rulemaking Proposed Regulation for In-Use On-Road Diesel Vehicles" (ARB, 2008b).

Lacking more detailed data, staff assumed that each tractor pulls the same model year trailer. With this assumption, staff calculated overall CO_2 reductions for each tractor-trailer combination as a function of calendar year, model year, tractor cab type, trailer van type, haul type, and trailer phase-in options. Since emissions data from EMFAC2011 does not provide information on haul type, cab type, van type, and options; staff used a variety of data sources to calculate weighted-average reduction factors as a function of calendar year, model year, and speed.

In order to calculate the population shares among the tractor-trailers that choose short- or local-haul exemptions, staff used the registration data from TRUCRS to aggregate the emission reduction factors over different haul types of long-, local-, and short-hauls. Having the total number of tractors and those that are exempt (either local or short haul), staff calculated the population shares of local or short haul by model year. Staff assumed that these shares will remain the same for 2012 model year and newer.

1.2.1. Day vs. Sleeper Cabs

Data from EMFAC2011-HD were used to calculate the splits between sleepers and non-sleeper tractors. Following EMFAC2011-HD, 42% of the affected heavy-duty truck vehicle miles travelled (VMT) is linked to the non-sleepers tractors, while the rest of the 58% are associated with sleeper tractors.

1.2.2. Trailer Type

The trailer production data from 1997 to 2000 Current Industrial Reports (Census, 2000) indicates that 69% of box type trailers are dry-van trailers and the rest (31%) are refrigerated-van trailers. Since this regulation only applies to 53" or longer box type trailers, staff also estimated the percent of VMT in California driven by 53" or longer box type trailers. According to this analysis, 68% of total Tractor-Trailer combinations are affected by this regulation.

1.2.3. Regulatory Options

According to the registration data from TRUCRS for small/large fleet options, 58% of pre-2011 model year trailers that are eligible for phase-in option will be fully compliant with the aerodynamic technology requirements by 2013, 30%are registered in Option 1 of the large fleet compliance plan and will be fully compliant by January 1, 2016. 11% are registered in Option 2 of the large fleet compliance plan and will also be fully

compliant by January 1, 2016, and 1% are registered in the small fleet compliance plan and will be fully compliant by January 1, 2017. Table III-1 and Table III-2 show the compliance phase-in dates and percentages for each compliance plan.

Table III- 1: Large Fleet Option 1 and 2 Compliance Plan Schedules

Option 1 % of Trailers	Option 2 % of Trailers	Compliance Before
5%	--	January 1, 2011
15%	20%	January 1, 2012
30%	40%	January 1, 2013
50%	60%	January 1, 2014
75%	80%	January 1, 2015
100%	100%	January 1, 2016

Table III- 2: Small Fleet Compliance Plan Schedule

Percentage of Trailers	Compliance Before
25%	January 1, 2014
50%	January 1, 2015
75%	January 1, 2016
100%	January 1, 2017

1.2.4. Benefits as a Function of Speed

Staff assumed that the full benefit from aerodynamic technology only occurs at speeds above 50 mph. Staff assumed aerodynamic technologies provide no benefit at speeds below 25 mph. Staff assumed a linear increase in aerodynamic technology effectiveness from 25 mph to 50 mph.[1]

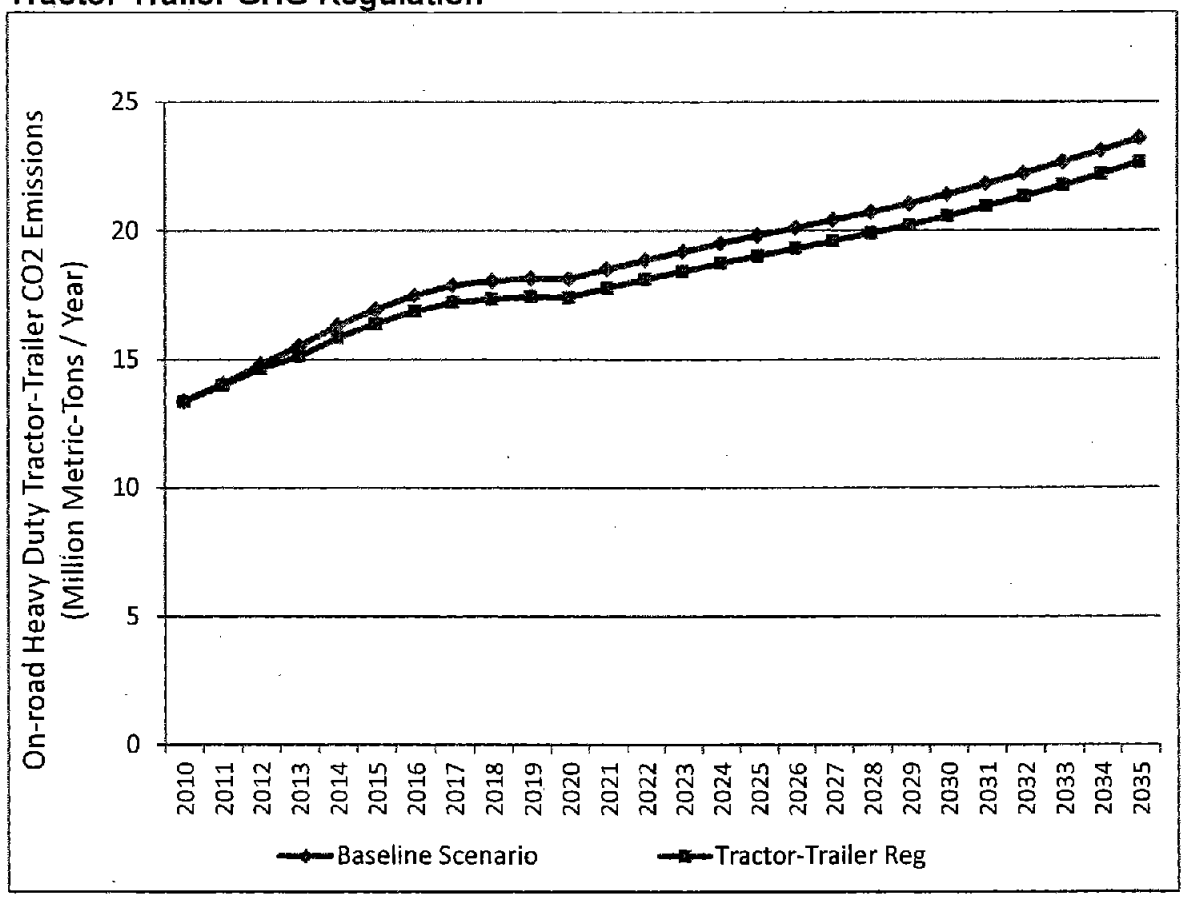
1.3. Emissions Inventory Results

Using the analysis described above, staff calculated a weighted average CO_2 emissions reduction factor at the calendar year, model year, and speed level across all tractor and trailer types, and across short and long haul types. This reduction factor was then combined with CO_2 emissions from EMFAC2011 to calculate the benefits of the regulation as originally adopted, as shown in Figure III- 1. Results suggest a 4% benefit

[1] Staff recognizes that aerodynamic effectiveness would be better approximated as a function of the square of the vehicle speed, resulting in a parabolic increase rather than a linear increase in effectiveness; and will gather the data necessary to further refine this assumption accordingly as part of future emission inventory analysis.

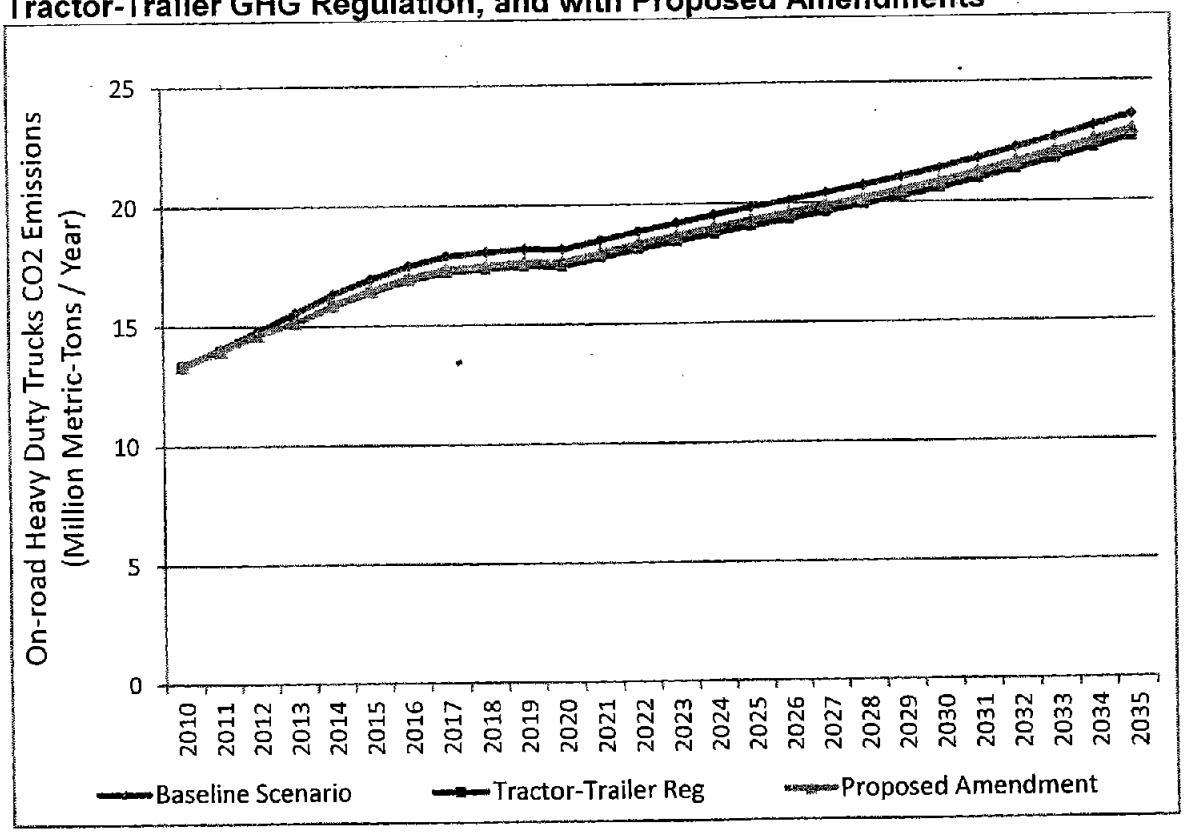
when the regulation is implemented, which a calculated composite from the assumptions is described above.

Figure III- 1: Statewide GHG Emissions without Regulation (Baseline) and with the Tractor-Trailer GHG Regulation



To harmonize the tractor requirements of the Tractor-Trailer GHG regulation with the proposed California Phase 1 GHG standards, the proposed amendments will sunset the requirements of the regulation for 2014 and subsequent model year tractors. Following the proposed amendments, the 2014 and newer tractors will not provide any emission reductions as a result of aerodynamic or tire improvements. The emissions impact of the proposed amendments is shown in Figure III- 2, and is negligible.

Figure III- 2: Statewide GHG Emissions without Regulation (Baseline), with the Tractor-Trailer GHG Regulation, and with Proposed Amendments



2. Emissions Benefits: Alignment with USEPA Phase-I Heavy Duty Truck Standards

In 2011, the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Transportation's National Highway Traffic Safety Administration (NHTSA) jointly adopted GHG emission standards and fuel economy standards for medium- and heavy-duty engines and vehicles, informally known as the "Phase 1" GHG regulations. The proposed California rule will align with federal GHG emission standards and fuel economy standards, and will follow the same structure and stringency levels of the EPA rule, including new engine and vehicle GHG requirements, etc.

2.1. Overview of Regulation

The regulation imposes new requirements for newly manufactured compression and spark ignited engines in Class 2b through Class 8 vehicles. Compliance requirements begin with model year 2014. The regulation is phased-in so that the regulation takes full effect in model year 2019. The Rule organizes truck compliance into three groupings:

- Heavy duty pickups and vans (Class 2b, 3)

- Vocational vehicles (VV) (Class 4 through 8)
- HD Tractor-Trailers (Class 7, 8)

Trucking operations in California differ substantially from the national average. Favorable weather conditions and other factors allow trucks that are operated primarily in California to be retained longer by fleets than the national average. In addition, the California trucking market is segmented, with national, regional and local fleets all competing in different segments of the goods movement economy. This leads to a different vehicle fleet mix, vehicle age, and VMT profiles than the national average. EMFAC2011 reflects these California-specific factors, and is used as the starting point for this analysis. This analysis focuses on the GHG emissions impact of the proposed rule as applied to heavy-duty vehicles operated in California.

2.2. Emissions Inventory Methods

2.2.1. Emission Rates

The EPA Phase-I Regulation sets CO_2 emission standards (gCO_2/ton-mi) for each vehicle category listed below:

- Vocational Vehicles
  - Heavy Heavy (Class 8)
  - Medium Heavy (Class 6 & 7-single-unit and Buses)
  - Light Heavy (Class 4-5)
- Tractors
  - Class 7
  - Class 8
    - Sleeper cab
    - Day cab
- Pickups and Vans
  - Diesel (Class 2b-3)
  - Gasoline (Class 2b-3)
- Buses

Since EMFAC2011 vehicle categories are different than the vehicle categories defined by Phase 1 regulations, staff made necessary adjustments described below to translate the emission reductions in terms of EMFAC2011 vehicle categories. These adjustments were derived from an analysis of VIUS data (Census, 2002) and EMFAC 2011 population/VMT data. ARB calculated the population/VMT shares for:

- T7 trucks (GVWR≥33,001)
  - Vocational (13%)
  - Day cabs tractor-trailer (43.5%)
  - Sleeper cab tractor-trailer (43.5%)
- T6 trucks (14,001≤GVWR≤33000)
  - Vocational class 4 and 5 (41%)
  - Vocational class 6 and 7 (51%)
  - Class 7 tractor-trailer (8%)
- LHDT(8,501≤GVWR≤14,000)[1]
  - Vocational (100%)
  - Tractor-trailer (0%)

Using these population/VMT shares, staff aggregated the emission rates obtained from the vehicle standards to obtain a composite CO_2 emission rate (g/mile) applicable to each EMFAC2011 vehicle category.

Staff applied these reductions to EMFAC2011-HD and LDV CO_2 emissions output. For this analysis, school bus, urban transit bus, motor coaches, motor homes, and all other buses were assigned the same reduction level as medium-heavy duty vocational vehicles. The percentage reductions in CO_2 emission rates with respect to 2010 are shown in Table III- 3.

Table III- 3: Phase 1 CO2 Emission Rate (g/mi) Reduction Percentage

Final Reduction Strategy					
Model Year	LHDT1/LHDT2 Gasoline Reduction	LHDT1/LHDT2 Diesel Reduction	T6 Composite Reduction	T7 Composite Reduction	Buses
2010	100.0%	100.0%	100.0%	100.0%	100.0%
2014	98.5%	97.7%	94.6%	87.3%	94.7%
2015	98.0%	97.0%	94.6%	87.3%	94.7%
2016	96.0%	94.0%	94.6%	87.3%	94.7%
2017	94.0%	91.0%	91.1%	84.8%	91.1%
2018+	90.0%	85.0%	91.1%	84.8%	91.1%

[1] Appendix III uses ARB's EMFAC2011 model definitions of weight classes, e.g., light heavy-duty as 8,501 to 14,000 pounds GVWR.

2.2.2. Rebound Effect

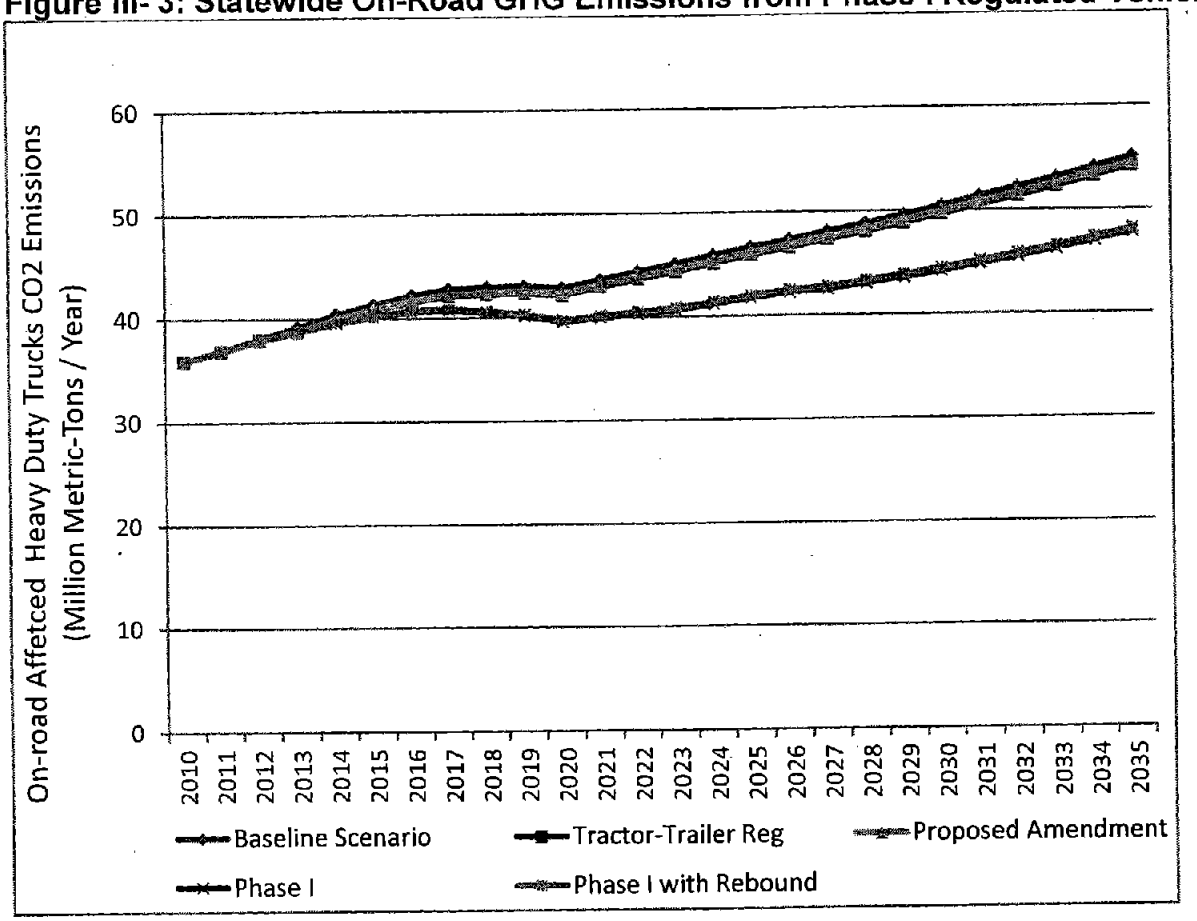
The Rebound Effect is the idea that the demand for driving is a function of the operating costs of the vehicle being driven. When operating costs increase, such as when fuel prices increase, driving becomes more expensive and people drive less. Conversely, if fuel prices decrease people may drive more. In the case of the Phase-I regulation, newly manufactured vehicles obtain better fuel economy and are therefore marginally less expensive to operate. As a result, staff expects there will be a marginal increase in the amount of miles driven per vehicle. Following EPA's Final Regulatory Impact Analysis (RIA) of GHG Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles section 5.3.2.2.2 (U.S. EPA, 2011b), a rebound effect of 1.18% for HD Pickup Vans, 1.33% for vocational vehicles and 0.5% for tractors was assumed.

2.3. Emissions Inventory Results

Figure III- 3 shows the impact of the Phase 1 regulation on GHG emissions from affected vehicles[1]. Results show a >10% reduction in GHG emissions by 2035.

[1] The affected EMFAC vehicle categories by Phase 1 regulation are heavy-duty trucks and buses exceeding 8,500 pounds GVWR.

Figure III- 3: Statewide On-Road GHG Emissions from Phase-I Regulated Vehicles*



*Without Regulation (Baseline), with the Tractor-Trailer GHG Regulation, with the Proposed Amendment to Tractor-Trailer GHG Regulation, with the Phase 1 Regulations, and with the Phase 1 Regulations Affected by Rebound.

3. Emissions Benefits: Optional Low NOx Standards

ARB's proposal for optional NO_x standards is an effort to encourage engine manufacturers to introduce new lower-emitting technologies than vehicles certified to today's 2010 emissions standard of 0.2 g/bhp-hr. Certification data demonstrates that although the NO_x standard for heavy-duty diesel engine is set at 0.2 g/bhp-hr, 25% of engine families are certified to levels lower than currently required, in the range of 0.03 - 0.14 g/bhp-hr.

3.1. Overview of Regulation

The proposed regulation provides engine manufacturers the option to certify new engines to a 0.1, 0.05, or 0.02 g/bhp-hr NO_x standard. The proposed optional low NO_x standards would encourage engine manufacturers to showcase new technologies and could be used to prioritize funding in incentive programs such as the Carl Moyer Memorial Air Quality Standards Attainment Program.

3.2. Emissions Inventory Methods

Because the proposed low NO_x engine emissions standards are optional, ARB staff has conducted a bounding exercise to estimate the percent of new engines that manufacturers will choose to certify to the proposed new standards. Staff developed two different scenarios, one with a high adoption rate and another with a low adoption rate. These scenarios estimate the percent of a manufacturer's engine product line that might potentially be certified to lower NO_x levels. Table III- 4 shows the proposed optional NO_x standards and the annual compliance percentage assumed under each adoption scenario from 2015 through 2035 model years.

Table III- 4: Assumed Percentage of Heavy Duty Engines Projected to Meet the Optional Low NOx Engine Emission Standards

High Adoption Scenario	2015	2020	2025	2030	2035
0.1 (50% below std.)	8.0	10.2	13.0	16.6	21.2
0.05 (75% below std.)	0.0	1.2	1.5	1.9	2.4
0.02 (90% below std.)	0.0	1.0	1.3	1.6	2.1
Low Adoption Scenario	**2015**	**2020**	**2025**	**2030**	**2035**
0.1 (50% below std.)	4.0	5.1	6.5	8.3	10.6
0.05 (75% below std.)	0.0	1.0	1.3	1.6	2.1
0.02 (90% below std.)	0.0	0.0	0.0	0.0	0.0

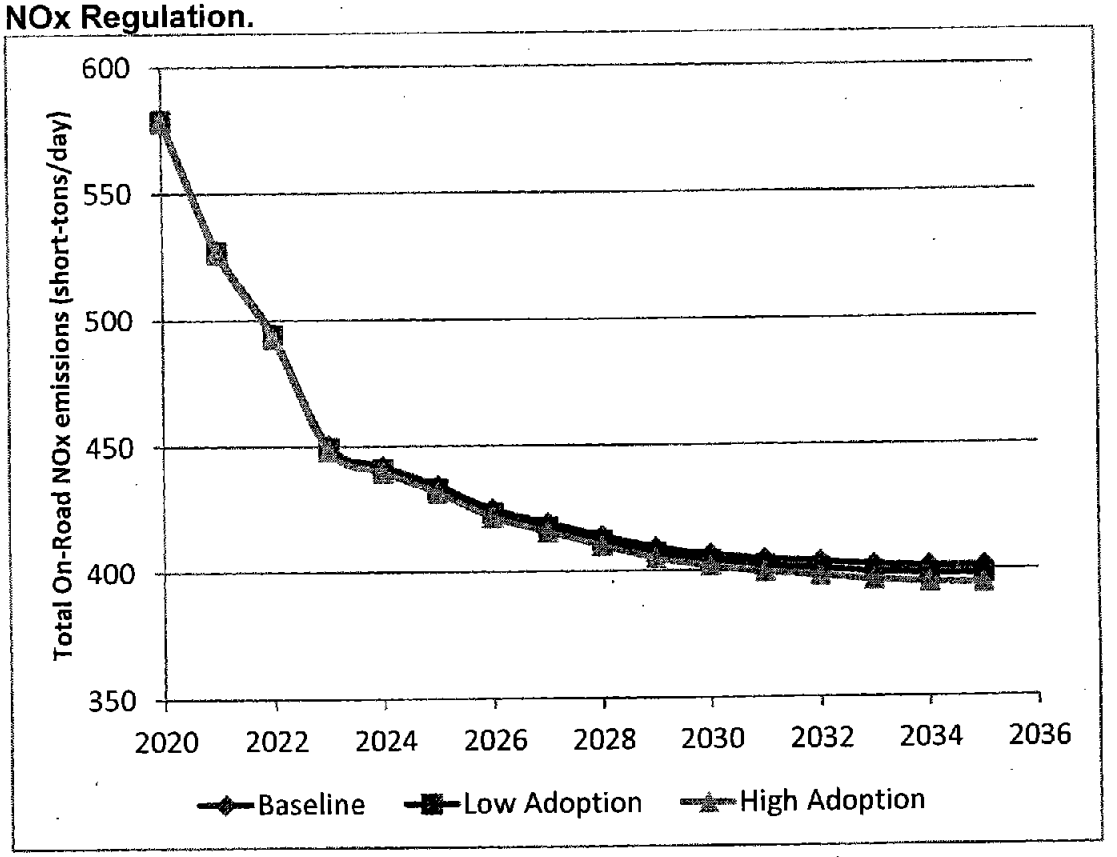
Staff used the assumed percent engine sales from these two adoption scenarios to estimate the overall NO_x emission rate reduction with respect the 2010 engine standard (0.2 g/bhp-hr). The analysis showed that by 2035, NO_x emission rates will decrease by 7% and 14% under low- and high-adoption scenarios.

In California, a sizeable fraction of trucks are purchased used on the national market. Staff assumed that used out-of-state heavy duty engines sold in California would not be certified to the optional low NO_x standards.

3.3. Emissions Inventory Results

Using these model year specific percent reductions in NO_x emission rates, staff assessed the emissions impact of the optional NO_x regulation under both high- and low-adoption scenarios. The result from this analysis is shown in Figure III- 4. The inventory analysis shows a NO_x benefit of 2.7 (low adoption) and 5.6 (high adoption) tons/day by 2032.

Figure III- 4: Statewide NOx Emissions without Regulation (Baseline), with Low Adoption Optional Low NOx Regulation, and with High Adoption Optional Low NOx Regulation.



Appendix IV – Heavy-duty Engine NOx Certification Levels

Heavy-duty Engine NOx Certification Levels Up to 0.17 g/bhp-hr

MODEL_YEAR	EO	NOx Cert Level	NOx_FEL	NOX_STD
2012	A-010-1682	0.03		0.20
2012	A-407-0001	0.03		0.20
2012	A-010-1658	0.05		0.20
2012	A-010-1658-1	0.05		0.20
2012	A-010-1662	0.05		0.20
2012	A-010-1662-1	0.05		0.20
2011	A-010-1599	0.05		0.20
2011	A-010-1603	0.05		0.20
2011	A-364-0028	0.05		0.20
2010	A-010-1561	0.05		0.20
2010	A-010-1561-1	0.05		0.20
2010	A-010-1567	0.05		0.20
2010	A-010-1567-1	0.05		0.20
2010	A-364-0022	0.05		0.20
2009	A-010-1510	0.05		0.20
2009	A-010-1510-1	0.05		0.20
2009	A-010-1518	0.05		0.20
2009	A-010-1518-1	0.05		0.20
2009	A-364-0020	0.05		0.20
2012	A-010-1660	0.07		0.20
2012	A-010-1664	0.07		0.20
2012	A-328-0052	0.07		0.20
2011	A-328-0046	0.07		0.20
2011	A-364-0025	0.07		0.20
2010	A-010-1563	0.07		0.20
2010	A-010-1565	0.07		0.20
2010	A-010-1569	0.07		0.20
2009	A-010-1512	0.07	0.35	*
2009	A-010-1520	0.07	0.35	*
2009	A-010-1520-1	0.07	0.35	*
2012	A-242-0069	0.08		0.20
2012	A-328-0051	0.08		0.20
2012	A-328-0053	0.08		0.20
2012	A-344-0027	0.08		0.20
2012	A-344-0033	0.08		0.20
2012	A-360-0017	0.08		0.20
2011	A-328-0045	0.08		0.20
2011	A-328-0047	0.08		0.20
2011	A-360-0015	0.08		0.20
2010	A-021-0535	0.08		0.20
2012	A-021-0572	0.09		0.20

2012	A-021-0572-1	0.09		0.20
2012	A-344-0029	0.09		0.20
2012	A-344-0029-1	0.09		0.20
2011	A-021-0541	0.09		0.20
2011	A-021-0541-1	0.09		0.20
2011	A-242-0063	0.09		0.20
2011	A-242-0063-1	0.09		0.20
2011	A-242-0063-2	0.09		0.20
2011	A-344-0020	0.09		0.20
2011	A-344-0022	0.09		0.20
2010	A-021-0535-1	0.09		0.20
2010	A-242-0058	0.09		0.20
2012	A-400-0004	0.1		0.20
2012	A-400-0004-1	0.1		0.20
2012	A-400-0004-2	0.1		0.20
2011	A-328-0044	0.1		0.20
2011	A-364-0027	0.1		0.20
2010	A-021-0518	0.1		0.20
2010	A-021-0520	0.1		0.20
2010	A-021-0533	0.1		0.20
2010	A-021-0534	0.1		0.20
2010	A-364-0026	0.1		0.20
2009	A-021-0491	0.1		0.20
2007	A-330-0163	0.1		*
2007	A-330-0167	0.1		*
2011	A-242-0062	0.11		0.20
2011	A-242-0062-1	0.11		0.20
2011	A-242-0065	0.11	0.41	*
2011	A-242-0065-1	0.11	0.41	*
2010	A-242-0055	0.11		0.20
2010	A-242-0055-1	0.11		0.20
2009	A-021-0479	0.11		0.20
2009	A-364-0016	0.11		0.20
2012	A-010-1655	0.12		0.20
2012	A-010-1657	0.12		0.20
2012	A-021-0573	0.12		0.20
2012	A-021-0573-1	0.12		0.20
2012	A-021-0574	0.12		0.20
2012	A-021-0574-1	0.12		0.20
2012	A-242-0067	0.12		0.20
2012	A-242-0068	0.12		0.20
2011	A-010-1576	0.12		0.20
2011	A-010-1576-1	0.12		0.20
2011	A-010-1576-2	0.12		0.20
2011	A-021-0539	0.12		0.20
2011	A-021-0540	0.12		0.20

2011	A-021-0540-1	0.12		0.20
2011	A-242-0061	0.12		0.20
2011	A-242-0061-1	0.12		0.20
2011	A-242-0061-2	0.12		0.20
2011	A-242-0061-3	0.12		0.20
2011	A-242-0062-2	0.12		0.20
2011	A-242-0065-2	0.12	0.41	0.20
2010	A-021-0533-1	0.12		0.20
2010	A-021-0534-1	0.12		0.20
2010	A-242-0057	0.12		0.20
2010	A-242-0057-1	0.12		0.20
2010	A-290-0136	0.12		0.20
2012	A-021-0561	0.13		0.20
2012	A-021-0563	0.13		0.20
2012	A-242-0066	0.13		0.20
2012	A-290-0141	0.13		0.20
2012	A-290-0141-1	0.13		0.20
2012	A-290-0142	0.13		0.20
2012	A-290-0142-1	0.13		0.20
2012	A-343-0008	0.13		0.20
2012	A-398-0003	0.13		0.20
2011	A-021-0536	0.13		0.20
2011	A-021-0537	0.13		0.20
2011	A-242-0060	0.13		0.20
2011	A-242-0060-1	0.13		0.20
2011	A-242-0060-2	0.13		0.20
2011	A-290-0137	0.13		0.20
2011	A-343-0007	0.13		0.20
2010	A-242-0056	0.13		0.20
2010	A-242-0056-1	0.13		0.20
2010	A-343-0006	0.13		0.20
2012	A-010-1666	0.14		0.20
2012	A-010-1668	0.14		0.20
2012	A-360-0018	0.14		0.20
2012	A-396-0003	0.14		0.20
2012	A-396-0004	0.14		0.20
2011	A-006-1739-2	0.14	0.50	*
2011	A-010-1601	0.14		0.20
2011	A-010-1606	0.14		0.20
2011	A-010-1608	0.14		0.20
2011	A-010-1612	0.14		0.20
2011	A-276-0032-2	0.14		0.20
2011	A-330-0231	0.14		0.20
2011	A-360-0013	0.14		0.20
2011	A-396-0001	0.14		0.20
2011	A-396-0002	0.14		0.20

2010	A-010-1559	0.14		0.20
2010	A-290-0134	0.14		0.20
2010	A-330-0223	0.14		0.20
2009	A-010-1508	0.14		0.20
2009	A-010-1508-1	0.14		0.20
2009	A-010-1516	0.14		0.20
2009	A-010-1516-1	0.14		0.20
2009	A-330-0209	0.14		0.20
2009	A-360-0011	0.14		0.20
2012	A-330-0233	0.15		0.20
2012	A-330-0233-1	0.15		0.20
2012	A-330-0233-2	0.15		0.20
2012	A-330-0234	0.15		0.20
2012	A-330-0234-1	0.15		0.20
2011	A-010-1582	0.15		0.20
2011	A-010-1584	0.15		0.20
2011	A-290-0139	0.15		0.20
2010	A-290-0135	0.15		0.20
2012	A-020-0257	0.16		0.20
2012	A-276-0033	0.16		0.20
2012	A-367-0017	0.16		0.20
2012	A-376-0008	0.16		0.20
2012	A-384-0003	0.16		0.20
2012	A-398-0004	0.16		0.20
2011	A-020-0253	0.16		0.20
2011	A-276-0032	0.16		0.20
2011	A-276-0032-1	0.16		0.20
2011	A-290-0138	0.16		0.20
2011	A-290-0138-1	0.16		0.20
2011	A-330-0228	0.16		0.20
2011	A-330-0228-1	0.16		0.20
2011	A-330-0230	0.16		0.20
2011	A-367-0015	0.16		0.20
2011	A-376-0005	0.16		0.20
2011	A-384-0002	0.16		0.20
2010	A-021-0528	0.16	0.35	*
2010	A-031-0068	0.16		0.20
2010	A-242-0059	0.16		0.20
2010	A-242-0059-1	0.16		0.20
2010	A-330-0218	0.16		0.20
2010	A-330-0225	0.16		0.20
2010	A-376-0004	0.16		0.20
2010	A-384-0001	0.16		0.20
2009	A-330-0205	0.16		0.20
2009	A-330-0206	0.16		0.20
2009	A-330-0216	0.16	0.32	*

2012	A-006-1790	0.17	0.50	0.20
2012	A-020-0258	0.17		0.20
2012	A-021-0560	0.17	0.33	0.20
2012	A-021-0560-1	0.17	0.33	0.20
2012	A-021-0576	0.17		0.20
2012	A-031-0071	0.17		0.20
2012	A-031-0071-1	0.17		0.20
2012	A-031-0071-2	0.17		0.20
2012	A-290-0140	0.17		0.20
2012	A-290-0140-1	0.17		0.20
2012	A-366-0003	0.17		0.20
2012	A-398-0002	0.17		0.20
2011	A-006-1739	0.17	0.50	*
2011	A-006-1739-1	0.17	0.50	*
2011	A-006-1741	0.17	0.50	*
2011	A-006-1741-1	0.17	0.50	*
2011	A-006-1741-2	0.17	0.50	*
2011	A-020-0254	0.17		0.20
2011	A-021-0550	0.17	0.33	*
2011	A-021-0550-1	0.17	0.33	0.20
2011	A-398-0001	0.17		0.20
2010	A-020-0249	0.17		0.20
2010	A-020-0249-1	0.17		0.20
2010	A-020-0250	0.17		0.20
2010	A-020-0250-1	0.17		0.20
2010	A-021-0525	0.17	0.33	*
2010	A-367-0013	0.17		0.20
2009	A-021-0517	0.17	0.40	*
2009	A-367-0011	0.17	0.20	*
2008	A-010-1448	0.17	0.21	0.20
2008	A-010-1448-1	0.17	0.21	0.20
2007	A-010-1381	0.17	*	*
2007	A-010-1381-1	0.17		*

Appendix V – Summary and Rationale for each Regulatory Provision

A. Proposed Phase 1 Regulations and Test Procedures

Proposed Amendments to the Proposed Regulation Order

Title 13

Section 1900(b): Definitions

Subsection (b)(3)

The addition of this definition, "emission standard," is needed to clarify the criteria used to determine if the requirements applicable to on-road motor vehicles and motor vehicle engines that are set forth in Article 2, Chapter 1, Division 3 of Title 13, California Code of Regulations are emission standards. The proposed definition revises the definition of "emission standard" set forth at Health and Safety Code section 39027 consistent with the express authorization of the Board to make such a revision in Health and Safety Code sections 39010 and 39601.

Subsection (b)(4)

The addition of this new definition, "evaporative emission standards," is needed to identify a subcategory of the new definition of emission standard.

Subsection (b)(5)

The addition of this new definition, "exhaust emission standards" or "tailpipe emission standards," is needed to identify a subcategory of the new definition of emission standard.

Subsection (b)(6) through (b)(25)

The renumbering of these subsections is necessary due to the addition of the proposed subsections (b)(3) through (b)(5).

Section 1956.8. Exhaust Emission Standards and Test Procedures – 1985 and Subsequent Model Heavy-Duty Engines and Vehicles.

Subsection (a)(7)

This new subsection is added to establish greenhouse gas (GHG) emission standards equivalent to the federal Phase 1 GHG standards for

new 2014 and subsequent model heavy-duty (HD) diesel engines, HD natural gas-fueled and liquefied-petroleum-gas (LPG)-fueled engines derived from diesel-cycle engines, and HD methanol-fueled diesel engines. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty engines and for harmonization with federal Phase 1 GHG regulations.

Subsection (a)(7)(A)

This new subsection establishes CO2 emission standards equivalent to the Phase 1 CO2 standards from new 2014 and subsequent model HD diesel engines, HD natural gas-fueled and LPG-fueled engines derived from diesel-cycle engines, and HD methanol-fueled diesel engines. It specifies equivalent FEL requirements; averaging, banking, and trading (ABT) program and credits requirements, alternate phase-in emission standards, and alternate emission standards based on 2011 MY engines. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty engines and for harmonization with federal Phase 1 GHG regulations.

Subsection (a)(7)(B)

This new subsection establishes a methane (CH4) emission standard equivalent to the Phase 1 CH4 standard from new 2014 and subsequent model HD diesel engines, HD natural gas-fueled and LPG fueled engines derived from diesel-cycle engines, and HD methanol-fueled diesel engines. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty engines and for harmonization with federal Phase 1 GHG regulations.

Subsection (a)(7)(C)

This new subsection establishes a nitrous oxide (N20) emission standard equivalent to the Phase 1 N20 standard from new 2014 and subsequent model HD diesel engines, HD natural gas-fueled and LPG fueled engines derived from diesel-cycle engines, and HD methanol-fueled diesel engines. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty engines and for harmonization with federal Phase 1 GHG regulations.

Subsection (b) Test Procedures

The existing subsection (b) is modified to update the reference to the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles." This referenced document is being modified as part of this rulemaking. As

such, the "last amended" date has been updated with a blank placeholder that will be updated to reflect the date the document is formally amended. The addition of this section is necessary in order to establish California GHG emission standards and test procedures for heavy-duty engines and for harmonization with federal Phase 1 GHG regulations.

Subsection (c)(4)

This new subsection is added to establish GHG emission standards equivalent to the Phase 1 GHG standards for new 2016 and subsequent model HD Otto-cycle engines. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty engines and for harmonization with federal Phase 1 GHG regulations.
Subsection (c)(4)(A)

This new subsection establishes CO2 emission standards equivalent to the Phase 1 CO2 standards from new 2016 and subsequent model HD Otto-cycle engines. It specifies equivalent family certification level FEL requirements; ABT program and credits requirements. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty engines and for harmonization with federal Phase 1 GHG regulations.

Subsection (c)(4)(B)

This new subsection establishes a CH4 emission standard equivalent to the Phase 1 CH4 standard from new 2016 and subsequent model Otto-cycle engines. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty engines and for harmonization with federal Phase 1 GHG regulations.

Subsection (c)(4)(C)

This new subsection establishes a nitrous oxide (N20) emission standard equivalent to the Phase 1 N20 standard from new 2016 and subsequent model Otto-cycle engines. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty engines and for harmonization with federal Phase 1 GHG regulations.

Subsection (d)

The existing subsection (d) is modified to update the reference to the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines." This referenced document is being modified as part of this rulemaking. As such, the "last amended" date has been updated with a blank placeholder

that will be updated to reflect the date the document is formally amended. In addition, a comma was removed from the later referenced document's title to reflect a similar change in the actual document's title. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty engines and test procedures and for harmonization with federal Phase 1 GHG regulations.

Subsection (h)(6)

This new subsection is added to establish GHG emission standards equivalent to the Phase 1 GHG standards for new 2014 and subsequent model heavy-duty diesel engines and 2016 and subsequent heavy-duty Otto-cycle engines used in medium-duty low-emission vehicles, ultra-low emission vehicles, and super-ultra-low emission vehicles. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty engines and for harmonization with federal Phase 1 GHG regulations.

Subsection (h)(6)(A)

This new subsection establishes CO2 emission standards equivalent to the Phase 1 CO2 standards from new 2014 and subsequent model Otto-cycle engines used in medium-duty low emission vehicles, ultra-low emission vehicles, and super-ultra-low emission vehicles. It specifies equivalent FEL requirements; ABT program and credits requirements, alternate phase-in emission standards, and alternate emission standards based on 2011 MY engines. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty engines and for harmonization with federal Phase 1 GHG regulations.

Subsection (h)(6)(B)

This new subsection establishes a CH4 emission standard equivalent to the Phase 1 CH4 standard from new 2014 and subsequent model HD diesel engines and new 2016 and subsequent heavy-duty Otto-cycle engines used in medium duty low emission vehicles, ultra-low emission vehicles, and super-low emission vehicles. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty engines and for harmonization with federal Phase 1 GHG regulations.

Subsection (h)(6)(C)

This new subsection establishes a N2O emission standard equivalent to the Phase 1 CH4 standard from new 2014 and subsequent model HD diesel engines and new 2016 and subsequent heavy-duty Otto-cycle

engines used in medium duty low emission vehicles, ultra-low emission vehicles, and super-low emission vehicles. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty engines and for harmonization with federal Phase 1 GHG regulations.

Subsection (i)

This new subsection contains the definition of terms used in this section; these terms, except for the ones noted below, are identical to those adopted in the federal Phase 1 GHG regulations. The addition of this section is necessary for harmonization with federal Phase 1 GHG regulations.

The addition of the definition in subsection (i)(2) "emission standard" is needed to clarify the criteria used to determine if the standards set forth in 13 CCR section 1956.8 and the remedies provided for in the Health and Safety Code for noncompliance, are emission standards. The proposed definition revises the definition of "emission standard" set forth at Health and Safety Code section 39027 consistent with the express authorization of the board to make such a revision in Health and Safety Code sections 39010 and 39601. The addition of the new definition in subsection (i)(3) "evaporative emission standards" is needed to identify a subcategory of the new definition of emission standard. The addition of the new definition in subsection (i)(4) "exhaust emission standards" or "tailpipe emission standards" is needed to identify a subcategory of the new definition of emission standard.

Section 2036, Defects Warranty Requirements for 1979 Through 1989 Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles; 1979 and Subsequent Model Motorcycles and Heavy-Duty Vehicles; and Motor Vehicle Engines Used in Such Vehicles.

Subsection (c)(4.1)

The existing subsection (4) describes the warranty period of diesel-powered heavy-duty vehicles and engines used in such vehicles. The new subsection (4.1) adds the warranty period requirements, which are identical to the federal Phase 1 regulations, of diesel-powered heavy-duty vehicles below 19,500 pounds GVWR that are certified to the GHG emission standards. The addition of this new subsection is necessary to ensure that manufacturers provide an emission warranty for diesel heavy-duty vehicles certified to GHG emission standards.

Subsection (c)(4.2)

The existing subsection (4) describes the warranty period of diesel-powered heavy-duty vehicles and engines used in such vehicles. The new subsection (4.1) adds the warranty period requirements, which are identical to the federal Phase 1 regulations, of diesel-powered heavy-duty vehicles at or above 19,500 pounds GVWR that are certified to GHG emission standards. The addition of this new subsection is necessary to ensure that manufacturers provide an emission warranty for diesel heavy-duty vehicles certified to GHG emission standards.

Subsection (c)(8.1)

The existing subsection (8) describes the warranty period of non-diesel-powered heavy-duty vehicles and engines used in such vehicles. The new subsection (8.1) adds the warranty period requirements, which are identical to the federal Phase 1 regulations, of non-diesel-powered heavy-duty vehicles that are certified to GHG emission standards. The addition of this new subsection is necessary to ensure that manufacturers provide and emission warranty for non-diesel heavy-duty vehicles certified to GHG emission standards.

Section 2037, Defects Warranty Requirements for 1990 and Subsequent Model Passenger Cars, Light-Duty Trucks, Medium-Duty Vehicles, and Motor Vehicle Engines Used in Such Vehicles.

Subsection (a.1)

The existing subsection (a) describes applicability of this section's warranty requirements to passenger cars, light-duty trucks, and medium-duty vehicles, and engines used in such vehicles. The new subsection (a.1) adds the applicability of medium-duty vehicles that are certified to the GHG emission standards to the warranty requirements of this section. The addition of this new subsection is necessary to ensure that manufacturers provide an emission warranty for the medium-duty vehicles certified to GHG emission standards.

Section 2112. Definitions

Subsection (l)(19.1)

This new subsection adds the useful life criteria for 2004 and subsequent model-year light heavy-duty diesel engines certified to the emission standards in section 1956.8, which are the Phase 1 GHG emission standards. This modification is necessary because the existing language

does not reference the Phase 1 GHG emission standards and is necessary for harmonization with federal Phase 1 GHG regulations.

Subsection (l)(20.1)

This new subsection adds the useful life criteria for 2004 and subsequent model-year medium heavy-duty diesel engines certified to the emission standards in section 1956.8, which are the Phase 1 GHG emission standards. This modification is necessary because the existing language does not reference the Phase 1 GHG emission standards and is necessary for harmonization with federal Phase 1 GHG regulations.

Subsection (21)

The references to paragraphs (20)(A) and (20)(B) are incorrect and are modified to instead cite paragraphs (21)(A) and (21)(B).

Subsection (l)(21.1)

This new subsection adds the useful life criteria for 2004 and subsequent model-year heavy heavy-duty diesel engines and urban buses certified to the emission standards in section 1956.8 or 1956.1, which includes the Phase 1 GHG emission standards. This modification is necessary because the existing language does not reference the Phase 1 GHG emission standards and is necessary for harmonization with federal Phase 1 GHG regulations.

Subsection (l)(22.1)

This new subsection adds the useful life criteria for 2004 and subsequent model-year heavy-duty Otto-cycle engines certified to the emission standards in section 1956.8, which includes the Phase 1 GHG emission standards. This modification is necessary because the existing language does not reference the Phase 1 GHG emission standards and is necessary for harmonization with federal Phase 1 GHG regulations.

Subsection (l)(25)

This new subsection establishes the useful life criteria for 2014 and subsequent MY heavy-duty vehicles at or below 19,500 pounds GVWR certified to the GHG emission standards of section 95663, title 17. The addition of this subsection is necessary for harmonization with federal Phase 1 GHG regulations.

Subsection (l)(26)

This new subsection establishes the useful life criteria for 2014 and subsequent model-year heavy-duty vehicles above 19,500 pounds and at or below 33,000 pounds GVWR certified to the GHG emission standards of section 95663, title 17. The addition of this subsection is necessary for harmonization with federal Phase 1 GHG regulations.

Subsection (l)(27)

This new subsection establishes the useful life criteria for 2014 and subsequent model-year heavy-duty vehicles above 33,000 pounds GVWR certified to the GHG emission standards of section 95663, title 17. The addition of this subsection is necessary for harmonization with federal Phase 1 GHG regulations.

Section 2139. Testing.

Subsection (b.1)

This new subsection adds the requirement for in-use compliance emission testing of chassis-certified medium-duty vehicles certified to the GHG emission standards of section 95663, Title 17 and that these tests are performed pursuant to section 95663, Title 17. The modification of this subsection is necessary in order to allow ARB to conduct GHG in-use compliance testing of medium-duty vehicles.

Subsection (c.1)

This new subsection adds the requirements for in-use compliance emission testing of engine-certified medium-duty vehicles certified to the GHG emission standards and that these tests are performed pursuant to section 1956.85, Title 13. The modification of this subsection is necessary in order to allow ARB to conduct GHG in-use compliance testing of engine-certified medium-duty vehicles.

Subsection (c)(2)

This subsection allows engine-certified medium-duty vehicles to be in-use compliance tested on chassis test procedures. The reference is added to include section 95663, Title 17, which contains the GHG test procedures incorporated by reference.

Subsection (d)

The existing subsection is modified by adding the requirement that in-use compliance emission tests for heavy-duty vehicles certified to the GHG emission standards of section 95663, title 17 be performed pursuant to section 95663, title 17. The modification of this subsection is necessary in order to allow ARB to conduct GHG in-use compliance testing of heavy-duty engines and vehicles.

Section 2140. Notification and Use of Test Results

Subsection (b)

The existing subsection is modified by adding a reference to 17 CCR 95663 to the list of applicable emission standards to which the in-use vehicle emission test results are compared, resulting in notification of standards exceedance to the manufacturer. The newly referenced section contains the GHG emission standards for 2014 and newer heavy-duty vehicles. The modification of this subsection is necessary in order to apply this section to the GHG emission standards of Section 95663.

Section 2147. Demonstration of Compliance with Emission Standards

Subsection (b)

The existing subsection is modified by adding a reference to 17 CCR 95663 to the list of applicable certification emission tests. The newly referenced section contains the GHG certification emission test requirements for 2014 and newer heavy-duty vehicles. The modification of this subsection is necessary in order to apply this section to the GHG emission standards of Section 95663.

Subsection (b)(3)

The existing subsection is modified by adding a reference to 17 CCR 95663 to the list of applicable certification emission tests that can be used to generate in-use data on which deterioration factors can be based. The newly referenced section contains the GHG certification emission test requirements for 2014 and newer heavy-duty vehicles. The modification of this subsection is necessary in order to apply this section to the GHG emission standards of Section 95663.

Title 17. Public Health
Division 3. Air Resources
Chap 1. Air Resources Board
Subchapter 10. Climate Change
Article 4. Regulations to Achieve Greenhouse Gas Emission Reductions.
Subarticle 12. Greenhouse Gas Emission Requirements for New 2014 and Subsequent Model Heavy-Duty Vehicles.

New subarticle 12 of 17 CCR, is added to establish emission standards and test procedures to control GHG emissions from on-road medium-and heavy-duty vehicles. These emission standards will reduce CO2, N2O, CH4, and other GHG emissions, resulting in more efficient, lower GHG emitting engines and vehicles. It is necessary to control and reduce GHG emissions in California because GHG emissions contribute to climate change.

Section 95660. Purpose

New section 95660 describes the purpose of the regulation codified under new subarticle 12, which is to reduce GHG emissions of CO2, N2O, CH4 and HFCs from new medium- and heavy-duty vehicles. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 95661. Applicability.

New section 95661 describes the applicability of subarticle 12 to all new 2014 and subsequent model medium- and heavy-duty vehicles, including vehicles fueled by conventional and alternative fuels, and electric vehicles. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 95662. Definitions.

This new subsection is added to define terms used in subarticle 12. In addition, it incorporates by reference the definitions provided in 13 CCR 1900(b). The addition of this section is necessary for harmonization with federal Phase 1 GHG regulations.

Section 95663. Greenhouse Gas Exhaust Emission Standards and Test Procedures for New 2014 and Subsequent Model Heavy-Duty Vehicles.

New section 95663 provides GHG exhaust emission standards and test procedures applicable to new 2014 and subsequent model heavy-duty vehicles.

Subsection (a)

This new subsection provides GHG exhaust emission standards applicable to new 2014 and subsequent model heavy-duty vehicles over 14,000 pounds GVWR. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Subsection (a)(1)

This subsection provides CO2 exhaust emission standards for new 2014 and subsequent model diesel and Otto-cycle vocational heavy-duty vehicles with a GVWR greater than 14,000 pounds. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Subsection (a)(1)(A)

This subsection provides CO2 exhaust emission standards for new 2014 and subsequent model diesel and Otto-cycle vocational heavy-duty vehicles with GVWR greater than 14,000 pounds. In addition, the subsection provides the requirements for the optional ABT program and for generating credits (subsection (a)(1)(A)1). Moreover, the subsection specifies the useful life that heavy-duty vocational vehicles must comply with the emission standards of this subsection (subsection (a)(1)(A)2). The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Subsection (a)(2)(A)

This subsection provides CO2 exhaust emission standards for new 2014 and subsequent model tractors with a GVWR greater than 26,000 pounds. In addition, the subsection provides the requirements for the optional ABT program and for generating credits applicable to heavy-duty tractors (subsection (a)(2)(A)1). Moreover, the subsection defines the useful life requirements (subsection (a)(2)(A)2) that tractors must comply with the emission standards specified in this subsection. The addition of

this section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Subsection (a)(2)(B)

Subsection (a)(2)(B) specifies the refrigerant leakage requirements from air conditioning systems from 2014 and later heavy-duty tractors. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Subsection (b)

This subsection provides GHG exhaust emission standards applicable to new 2014 and subsequent model diesel and Otto-cycle medium-duty vehicles between 8,501 to 14,000 pounds GVWR. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Subsection (b)(1)(A)

This subsection provides the methodology to calculate the national-fleet average CO2 emission standard that a manufacturer must meet for each model year of diesel medium-duty vehicles. To provide manufacturers added compliance flexibility, the subsection also provides two phase-in provisions to choose from for phasing in the diesel fleet average CO2 targets. Moreover, the subsection provides the useful life that the diesel medium-duty vehicle must comply with the emission standards specified in subsection 95663(b)(1)(A). Furthermore, the subsection specifies the in-use CO2 standards that will be used for selective enforcement audits and in-use testing. This subsection also provides the N2O and CH4 emission standards for new 2014 and later model medium-duty vehicles. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Subsection (b)(1)(B)

This subsection provides the methodology to calculate the national-fleet average CO2 emission standard that a manufacturer must meet for each model year of its Otto-cycle medium-duty vehicles. To provide manufacturers added compliance flexibility, the subsection also provides two phase-in provisions to choose from for phasing-in the Otto-cycle fleet average CO2 targets. Moreover, the subsection provides the useful life

that the Otto-cycle medium-duty vehicle must comply with the emission standards specified in subsection 95663(b)(1)(B). Furthermore, the subsection specifies the in-use CO2 standards that will be used for selective enforcement audits and in-use testing. This subsection also provides the N2O and CH4 emission standards for new 2014 and later model medium-duty vehicles. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Subsection (b)(1)(C)

This subsection specifies the refrigerant leakage requirements from air conditioning systems from 2014 and later medium-duty vehicles. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Subsection (c)

This subsection incorporates by reference the test procedures for determining compliance with GHG emission standards applicable to 2014 and subsequent model medium- and heavy-duty vehicles. The addition of this section is necessary in order to establish California GHG emission standards and test procedures for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 95664. Severability.

This subsection discusses the severability of any section, paragraph, subparagraph, sentence, clause, phrase, or portion of the subarticle. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Proposed Amendments to the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles"

List of Documents to be used in Conjunction with this Document

Three documents are referenced in this section. It is necessary to include them to indicate the documents that are referred to and are used in conjunction with these test procedures for the certification of heavy-duty diesel engines.

Introductory paragraph

The purpose of this paragraph is to reference the sections of the CFR that are incorporated by reference and amended in the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles." The change to this paragraph is necessary to add Subpart A through I of Part 1036, which contains the Phase 1 GHG federal regulations.

Subsection I. 86.1

86.1 was updated as part of U.S. EPA's Phase 1 Final Rule and describes the reference material of Subpart A, Part 86. Addition of this section is needed to allow harmonization with federal regulations.

Part 86, Subpart A

Subsection 1.A.3.

86.016-1 is a new CFR section, added as part of the federal Phase 1 GHG Final Rule and updated the previous 86.005-1, which describes the general applicability of Subpart A, Part 86. Addition of this section is needed to allow harmonization with federal regulations. Moreover, the changes to this section are necessary to maintain existing California requirements as shown in 86.005-1 and 86.001-1 and with existing California on-board diagnostic requirements.

Subsection 2.A.

86.012-2 is a new CFR section added as part of the U.S. EPA Phase 1 Final Rule, which describes definitions. This new section 86.012-2 redefines the term "urban bus." Addition of this section is needed to allow harmonization with federal regulations. Moreover, the changes to the definition of urban bus are necessary to maintain this new definition of urban bus for the Phase 1 GHG federal regulations while maintaining the previous definition of urban bus to apply to other existing ARB regulations.

Subsection 2.B.

This subsection contains California definitions that apply to this subpart. The change to this subsection is needed to define additional terms that are used in the subpart. In addition, corrections are made to two existing definitions. Finally, quotations are added to one definition to maintain consistent format in this subsection.

Subsection 17.

This section deletes the federal on-board diagnostic provisions for engines less than or equal to 14,000 pounds GVWR and replaces them with requirements from the CCR. The title change of this section and the addition of 86.007-17 were made in a previous federal rulemaking and are necessary to be updated for consistency with the federal requirements.

Subsection 18.

This section deletes the on-board diagnostics for engines used in applications greater than 14,000 pounds GVWR and replaces them with requirements from the CCR. This section was modified as part of the federal Phase 1 GHG Final Rule, and the change in the title is necessary to maintain consistency with the federal requirements.

Subsection 23.A.

This subsection, which describes the required data for the submission of an engine certification for application, was updated in the federal Phase 1 GHG Final Rule. The updated date in this section is needed to allow harmonization with federal regulations. Moreover, the address modification is necessary because the mailing address of ARB has changed.

Part 86, Subpart S

Section 86.1863-07

This subsection, which describes the optional chassis certification for diesel vehicle from 8,500 to 14,000 pounds GVWR, was updated in the federal Phase 1 GHG Final Rule. The updated date in this section is needed to allow harmonization with federal regulations. In addition, the corrections in subsection 4 are necessary for harmonization with the federal regulations.

Part 1036

The federal Phase 1 GHG emission standards and requirements are incorporated by reference in this part, and it is necessary to add this part in order to include these emission standards and requirements for California certification. Unless otherwise noted below, the CFR sections are incorporated by reference without change. The CFR date next to the section is either November 14, 2011, which is the original federal Phase

1 GHG Final Rule effective date, or August 16, 2013, which is the subsequent Phase 1 GHG Technical Amendment effective date.

Section 1036.1
This section is added to describe the engine model years and engine fuel types subject to the requirements of part 1036, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.2

This section describes the parties that are responsible for compliance with the requirements of this part. It specifies engine manufacturers as the main party responsible for compliance. Its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.5

This section is added to describe the type of engines that are excluded from the requirements of this part, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.10

This section describes the various subparts that make up this part 1036, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.15

This section describes other regulation parts (such as parts 86, 1037, 1065, 1068) that affect engines that are subject to this part 1036. Its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.30

This section provides ARB's designated person and address to whom the certifying manufacturer has to submit all reports and requests for approval. Its addition is necessary to provide the correct mailing address.

Section 1036.100

This section provides an overview of the exhaust emission standards to which engines subject to the requirements of this part must comply, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.108

This section specifies exhaust emission standards for CO2, N2O, and CH4 that affected engines must meet to comply with the requirements of this part, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations. Moreover, it provides an additional, optional compliance path for manufacturers referred to as the "Optional Compliance Via the 2014 MY National Heavy-Duty Engine and Vehicle Greenhouse Gas Program," which is necessary for added compliance flexibility for manufacturers.

Section 1036.115

This section describes other requirements, such as warranty, that engine manufacturers must comply with, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.130

This section contains engine installation instructions for vehicle manufacturers, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations. Moreover, the change to subparagraph (b)(2) is needed to reference California regulatory authority for penalties.

Section 1036.135

This section describes the engine labeling requirements, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations. Moreover, changes to the introductory paragraph are needed to ensure that labels contain California provisions as provided in 86.007-35(a)(3), as modified by these test procedures.

Section 1036.140

This section defines the primary intended service class of the applicable engines into the following categories: light heavy-duty engines, medium heavy-duty engines, and heavy heavy-duty engines. Its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.150

This section describes interim provisions such as banking GHG emission for early compliance, 2014 model year nitrous oxide standards, and alternate phase-in standards. Its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations. Moreover, changes to subparagraph (a) allow manufacturers to generate emission credit for 2013 and earlier model year compliance, equivalent to the federal ABT program. This change is necessary in order to establish an equivalent California ABT program to the federal ABT program.

Section 1036.205

This section describes the information that must be included in a certification application, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.
Section 1036.210

This section described the process to provide preliminary approval before submitting an application for certification, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.225

This section contains the procedures for amending an application for certification once it has been submitted for certification, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.230

This section contains the instructions for how to select engine families, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations

Section 1036.235

This section describes the emission testing requirements to show compliance with the GHG emission standards, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.241

This section shows how to demonstrate compliance with the GHG emission standards, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.250

This section describes the reporting and recordkeeping requirements for certification, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.255

This section describes the decisions that the U.S. EPA (or ARB) may make regarding certification and issuing of an Executive Order, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.401

This section describes how in-use testing will be performed by U.S. EPA (or ARB) as well as the manufacturer's obligation to test in-use engines, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations

Section 1036.501

This section specifies how to run a valid certification emission test using the standard or special equipment and procedures, and its addition is necessary for establishing GHG test procedures for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.525

This section contains requirements for testing hybrid engines, and its addition is necessary for establishing GHG test procedures for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.530

This section describes how to calculate official emission test results for GHG emissions, and its addition is necessary for establishing GHG test procedures for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.601

This section contains compliance provisions for engine manufacturers as well as owners, operators, and rebuilders of engines, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.610

This section specifies the provisions for generating innovative technology credits of powertrain technologies that were not in common use with heavy-duty engines before 2010 model year. Its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations. In addition, changes are made to subparagraph (d) to remove the reference to 40 CFR 86.1866 and are necessary because this federal reference is not applicable to California law.

Section 1036.615

This section describes how to generate advanced technology-specific emission credits for hybrid powertrains and for engine with Rankine

cycle waste heat recovery systems. Its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.620

This section describes an alternative schedule for compliance with the CO2 emission standards based on the model year 2011 diesel engines, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.625

This section describes the process to apply a higher in-use FEL based on forfeiting an appropriate number of emission credits, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.701

This section describes the general provisions of the ABT program, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.705

This section contains the provisions for calculating emission credits for each GHG pollutant in the ABT program, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.710

This section specifies how to average emission credits for an averaging set in the ABT program, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.715

This section specifies how to bank excess credits in the ABT program, and its addition is necessary for establishing GHG emission standards

for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.720

This section specifies how to trade excess emission credits between manufacturers, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.725

This section describes the information to include in the application for certification if the manufacturer participates in the ABT program, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.730

This section describes the requirements to submit end-of-year and final reports if the manufacturer participates in the ABT program, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.735

This section describes the recordkeeping provisions for manufacturers, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.
Section 1036.740

This section specifies the restrictions for using emission credits, such as defining the averaging set, applying credits to prior year deficits, credits from hybrid engine and other advanced technologies, and credit life. The addition of this section is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.745

This section contains the provisions for remedying end-of-year CO2 credit deficits, and its addition is necessary for establishing GHG

emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.750

This section specifies the consequences for not complying with the provisions of this subpart, such as voiding the Executive Order, and its addition is necessary for establishing GHG emission standards for heavy-duty diesel engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.801

This section contains the definitions that apply to this part and its addition is necessary for harmonization with federal Phase 1 GHG regulations. Moreover, the addition of subparagraph B. is needed to incorporate California-specific definitions into these test procedures.

Section 1036.805

This section explains the symbols, acronyms, and abbreviations that are used in this part, and its addition is necessary for harmonization with federal Phase 1 GHG regulations.

Section 1036.810

This section describes the material that is incorporated by reference in Part 1036, and its addition is necessary for harmonization with federal Phase 1 GHG regulations.

Section 1036.815

This section references existing provisions to apply for submitted information to be considered confidential, and its addition is necessary for harmonization with federal Phase 1 GHG regulations. Moreover, the addition of subparagraph B. is needed in order to reference California regulatory authority to consider confidential information.

Section 1036.820

This section contains the requirements for requesting a hearing, and its addition is necessary for harmonization with federal Phase 1 GHG regulations. Moreover, the changes to subparagraphs (a) and (c) are needed in order to reference California regulatory authority to request a hearing.

Section 1036.825

This section describes the reporting and recordkeeping requirements of the engine manufacturer, and its addition is necessary for harmonization with federal Phase 1 GHG regulations.

Part 1065

All changes to Part 1065 update the incorporated CFR sections to the most current versions; the amended date has been updated to either November 14, 2011, which is the original federal Phase 1 GHG Final Rule effective date, or August 16, 2013, which is the subsequent Phase 1 GHG Technical Amendment effective date. These changes are needed to allow harmonization with federal regulations.

Proposed Amendments to the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines"

Title Modification

The title was updated to add "and Vehicles" because these test procedures currently apply to medium-duty vehicles that use Otto-cycle engines.

List of Documents to be Used in Conjunction with this Document

Three documents are referenced in this section. It is necessary to include them to indicate the documents that are referred to and are used in conjunction with these test procedures for the certification of heavy-duty Otto-cycle engines.

Introductory paragraph

The purpose of this paragraph is to reference the sections of the CFR that are incorporated by reference and amended in the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines." The change to this paragraph is necessary to add Subparts A through I of Part 1036 and Subparts A through K of Part 1065, which contains the Phase 1 GHG federal regulations.

Part 86, Subpart A

Subsection 1.A.3.

86.016-1 was a new CFR section added as part of the federal Phase 1 GHG Final Rule and updated the previous 86.005-1, which describes

the general applicability of Subpart A, Part 86. Addition of this section is needed to allow harmonization with federal regulations. Moreover, the changes to this section are necessary to maintain existing California requirements as shown in 86.005-1 and 86.001-1.

Subsection 2.A.3.

86.012-2 was a new CFR section added as part of the U.S. EPA Phase 1 Final Rule, which describes definitions. This new section 86.012-2 redefines the term "urban bus." Addition of this section is needed to allow harmonization with federal regulations. Moreover, the changes to the definition of urban bus are necessary to maintain this new definition of urban bus for the Phase 1 GHG federal regulations while maintaining the previous definition of urban bus to apply to other existing ARB regulations.

Subsection 2.B.

This subsection contains California definitions that apply to this subpart. The change to this subsection is needed to define additional terms that are used in the subpart. In addition, corrections are made to two existing definition. Finally, quotations are added to one definition to maintain consistent format in this subsection.

Subsection 10.B.1.footnote in table

This modification corrects the footnote for the NOx emission standard of 2008 and subsequent Otto-cycle engines to refer to the same footnote as the NMHC emission standard. This modification is necessary to correct the mistake.
Subsection 23.

This subsection, which describes the required data for the submission of an engine certification for application, was updated in the federal Phase 1 GHG Final Rule. The change in this section is needed to allow harmonization with federal regulations.

Subsection 35 A

This subsection contains the emission label requirements for Otto-cycle engines. This modification clarifies the emission label requirements to include a statement of conformity to California regulations and is necessary for the enforcement of engines certified to the GHG regulations.

Part 1036

The federal Phase 1 GHG emission standards and requirements are incorporated by reference in this Part, and it is necessary to add this part in order to include these emission standards and requirements for California certification. Unless otherwise noted below, the CFR sections are incorporated by reference without change. The CFR date next to the section is either November 14, 2011, which is the original federal Phase 1 GHG Final Rule effective date, or August 16, 2013, which is the subsequent Phase 1 GHG Technical Amendment effective date.

Section 1036.1

This section is added to describe the engine model years and engine fuel types subject to the requirements of part 1036, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.2

This section describes the parties that are responsible for compliance with the requirements of this Part. It specifies engine manufacturers as the main party responsible for compliance. Its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.5

This section is added to describe the type of engines that are excluded from the requirements of this part, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.10

This section describes the various subparts that make up this part 1036, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.15

This section describes other regulation parts (such as parts 86, 1037, 1065, 1068) that affect engines that are subject to this part 1036. Its

addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.30

This section provides ARB's designated person and address to whom the certifying manufacturer has to submit all reports and requests for approval. Its addition is necessary to provide the correct mailing address.

Section 1036.100

This section provides an overview of the exhaust emission standards to which engines subject to the requirements of this part must comply, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.108

This section specifies exhaust emission standards for CO2, N2O, and CH4 that affected engines must meet to comply with the requirements of this part, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations. Moreover, it provides an additional, optional compliance path for manufacturers referred to as the "Optional Compliance Via the 2014 MY National Heavy-Duty Engine and Vehicle Greenhouse Gas Program," which is necessary for added compliance flexibility for manufacturers.

Section 1036.115

This section describes other requirements, such as warranty, that engine manufacturers must comply with, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.130

This section contains engine installation instructions for vehicle manufacturers, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations. Moreover, the change to subparagraph (b)(2) is needed to reference California regulatory authority for penalties.

Section 1036.135

This section describes the engine labeling requirements, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations. Moreover, changes to the introductory paragraph are needed to ensure that labels contain California provisions as provided in 86.007-35(a)(3), as modified by these test procedures.

Section 1036.140

This section defines the primary intended service class of the applicable engines into the following categories: light heavy-duty engines, medium heavy-duty engines, and heavy heavy-duty engines. Its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.150

This section describes interim provisions such as banking GHG emission for early compliance, 2014 model year nitrous oxide standards, and alternate phase-in standards. Its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.205

This section describes the information that must be included in a certification application, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.210

This section described the process to provide preliminary approval before submitting an application for certification, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.225

This section contains the procedures for amending an application for certification once it has been submitted for certification, and its addition

is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.230

This section contains the instructions for how to select engine families, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.235

This section describes the emission testing requirements to show compliance with the GHG emission standards, and its addition is necessary for harmonization with federal Phase 1 GHG regulations.

Section 1036.241

This section shows how to demonstrate compliance with the GHG emission standards, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.250

This section describes the reporting and recordkeeping requirements for certification, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.255

This section describes the decisions that the U.S. EPA (or ARB) may make regarding certification and issuing of an Executive Order, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.401

This section describes how in-use testing will be performed by U.S. EPA (or ARB) as well as the manufacturer's obligation to test in-use engines, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.501

This section specifies how to run a valid certification emission test using the standard or special equipment and procedures, and its addition is necessary for establishing GHG test procedures for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.525

This section contains requirements for testing hybrid engines, and its addition is necessary for establishing GHG test procedures for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.530

This section describes how to calculate official emission test results for GHG emissions, and its addition is necessary for establishing GHG test procedures for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.601

This section contains compliance provisions for engine and equipment manufacturers as well as owners, operators, and rebuilders of engines, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.610

This section specifies the provisions for generating innovative technology credits of powertrain technologies that were not in common use with heavy-duty engines before 2010 model year. Its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations. Moreover, changes are made to subparagraph (d) to remove the reference to 40 CFR 86.1866 and are necessary because this federal reference is not applicable to California law.

Section 1036.615

This section describes how to generate advanced technology-specific emission credits for hybrid powertrains and for engine with Rankine

cycle waste heat recovery systems. Its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.620

This section describes an alternative schedule for compliance with the CO2 emission standards based on the model year 2011 engines, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.625

This section describes the process to apply a higher in-use FEL based on forfeiting an appropriate number of emission credits, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.701

This section describes the general provisions of the ABT program, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.705

This section contains the provisions for calculating emission credits for each GHG pollutant in the ABT program, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.710

This section specifies how to average emission credits for an averaging set in the ABT program, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.715

This section specifies how to bank excess credits in the ABT program, and its addition is necessary for establishing GHG emission standards

for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.720

This section specifies how to trade excess emission credits between manufacturers, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.725

This section describes the information to include in the application for certification if the manufacturer participates in the ABT program, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.730

This section describes the requirements to submit end-of-year and final reports if the manufacturer participates in the ABT program, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.735

This section describes the recordkeeping provisions for manufacturers, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations

Section 1036.740

This section specifies the restrictions for using emission credits, such as defining the averaging set, applying credits to prior year deficits, credits from hybrid engine and other advanced technologies, and credit life. The addition of this section is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.745

This section contains the provisions for remedying end-of-year CO2 credit deficits, and its addition is necessary for establishing GHG

emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.750

This section specifies the consequences for not complying with the provisions of this subpart, such as voiding the Executive Order, and its addition is necessary for establishing GHG emission standards for heavy-duty Otto-cycle engines and for harmonization with federal Phase 1 GHG regulations.

Section 1036.801

This section contains the definitions that apply to this part and its addition is necessary for harmonization with federal Phase 1 GHG regulations. Moreover, the addition of subparagraph B. is needed to incorporate California-specific definitions into these test procedures.

Section 1036.805

This section explains the symbols, acronyms, and abbreviations that are used in this part, and its addition is necessary for harmonization with federal Phase 1 GHG regulations.

Section 1036.810

This section describes the material that is incorporated by reference in Part 1036, and its addition is necessary for harmonization with federal Phase 1 GHG regulations.

Section 1036.815

This section references existing provisions to apply for submitted information to be considered confidential, and its addition is necessary for harmonization with federal Phase 1 GHG regulations. Moreover, the addition of subparagraph B. is needed in order to reference California regulatory authority to consider confidential information.

Section 1036.820

This section contains the requirements for requesting a hearing, and its addition is necessary for harmonization with federal Phase 1 GHG regulations. Moreover, the changes to subparagraphs (a) and (c) are needed in order to reference California regulatory authority to request a hearing.

Section 1036.825

This section describes the reporting and recordkeeping requirements of the engine manufacturer, and its addition is necessary for harmonization with federal Phase 1 GHG regulations. Moreover, the deletion of subparagraphs (e) is needed in order to delete a reference to the federal regulations.

Part 1065

All changes to Part 1065 update the incorporated CFR sections to the most current versions; the amended date has been updated to either November 14, 2011, which is the original federal Phase 1 GHG Final Rule effective date, or August 16, 2013, which is the subsequent Phase 1 GHG Technical Amendment effective date. These changes are needed to allow harmonization with federal regulations.

Proposed Amendments to the "California Greenhouse Gas Exhaust Emission Standards and Test Procedures for 2014 and Subsequent Model Heavy-Duty Vehicles"

The new document, "California Greenhouse Gas Exhaust Emission Standards and Test Procedures for 2014 and Subsequent Model Heavy-Duty Vehicles", contain the proposed GHG emission standards and test procedures for heavy-duty vehicle certification beginning in the 2014 model year. These emission standards will reduce CO2, N2O, CH4, and other GHG emissions, resulting in more efficient, lower GHG emitting engines and vehicles. It is necessary to control and reduce GHG emissions in California because GHG emissions contribute to climate change.

List of Documents to be used in Conjunction with this Document

Two documents are referenced in this section. It is necessary to include them to indicate the documents that are referred to and are used in conjunction with the HDV TPs for the certification of heavy-duty vehicles.

Introductory Paragraphs

The two introductory paragraphs describe the format of the HDV TPs. The first paragraph establishes the provisions of the CFR that are incorporated by reference in the HDV TPs. These provisions use the version of the CFR as adopted by the U.S. EPA on November 14, 2011 (the original federal Phase 1 GHG Final Rule effective date), unless otherwise noted next to the subsection (The CFR date next to some sections may be August 16, 2013, which is the Phase 1 GHG Technical Amendment effective date.).

The second paragraph shows the notations used in the document to indicate whether a change is made or not to the cited CFR section as well as other notations. These explanatory paragraphs are necessary to be added in order to clarify how to accurately read and understand the HDV TPs.

Part 1037.

Section 1037.1

This section describes the applicability of this part to six types of GHG emissions and to all new heavy-duty vehicles. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

In addition, California-specific provisions were added to this section to show applicability to medium- and heavy-duty vehicles. Moreover, references to the national vehicle sales are redefined as California sales, except in the ABT program. Furthermore, any references to U.S. EPA hearings, inspections, and the like are not applicable. These California-specific provisions are necessary in order to establish an effective California program to control GHG emissions from heavy-duty vehicles.

Section 1037.5

This section is added to describe the type of vehicles that are excluded from the requirements of this part, and its addition is necessary for harmonization with federal Phase 1 GHG regulations.

Section 1037.10

This section describes the various subparts that make up this part 1037, and its addition is necessary for harmonization with federal Phase 1 GHG regulations.

Section 1037.15

This section describes other regulation parts (such as parts 1065 and 1066) that affect vehicles that are subject to this part 1037. Its addition is necessary for harmonization with federal Phase 1 GHG regulations.

Section 1037.30

This section directs all reports and requests for approval to be sent to the Designated Compliance Officer. Its addition is necessary for harmonization with federal Phase 1 GHG regulations.

Section 1037.101

This section provides an overview of emission standards for heavy-duty vehicles, including criteria exhaust, GHG exhaust, and fuel evaporative emissions. Its addition is necessary for harmonization with federal Phase 1 GHG regulations. In addition, changes are made in subparagraphs (b)(1) and (b)(4) to show that references to criteria exhaust and fuel evaporative emissions are not applicable to these procedures. The addition of these changes is needed for consistency that the HDV TPs are applicable only to GHG emissions. Moreover, changes to subparagraph (b)(2) provide an additional, optional compliance path for manufacturers referred to as the "Optional Compliance Via the 2014 MY National Heavy-Duty Engine and Vehicle Greenhouse Gas Program," which is necessary for added compliance flexibility for manufacturers.

Section 1037.102

This section references 40 CFR part 86 for the criteria exhaust emission standards. Its addition is necessary to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations. Moreover, it was modified to reference California's exhaust emission standards in the applicable test procedures (these documents are listed in "List of Documents to be Used in Conjunction with this Document" at the beginning of the HDV TPs.) This modification is necessary to establish an effective California program to control emissions from heavy-duty vehicles.

Section 1037.104

This section contains the GHG exhaust emission standards for CO2, CH4, and N2O for heavy-duty vehicles at or below 14,000 pounds GVWR. It describes the methodology to calculate the national-fleet average CO2 emission standard that a manufacturer must meet for each model year of diesel and Otto-cycle medium-duty vehicles. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.105

This section establishes CO2 exhaust emission standards for new 2014 and subsequent model diesel and Otto-cycle vocational heavy-duty vehicles with GVWR greater than 14,000 pounds. Moreover, it specifies the useful life requirements for compliance with the emission standards. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.106

This subsection provides CO2 exhaust emission standards for new 2014 and subsequent model tractors with GVWR greater than 26,000 pounds. Moreover, it specifies the useful life requirements for compliance with the emission standards. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.115

This section describes other requirements, such as adjustable parameters, prohibited controls, and air condition leakage requirements, that vehicle manufacturers must comply with. The addition of the section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.120

This section specifies the warranty requirements that the vehicle manufacturer must provide to the ultimate purchaser and the components that would be covered in the warranty. The addition of the section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.125

This section specifies the requirements that the vehicle manufacturer must provide to the ultimate purchaser regarding maintenance instructions and allowable maintenance. The addition of the section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.135

This section describes the engine labeling requirements, and its addition is necessary for harmonization with federal Phase 1 GHG regulations. Moreover, changes to the subsection (b)(8) ensure that labels contain California provisions, and are necessary in order to establish California GHG emission standards for heavy-duty vehicles.

Section 1037.140

This section describes how to determine a vehicle's curb weight and roof height. The addition of the section is necessary to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.150

This section describes interim provisions such as banking GHG emission credits for early compliance, phase-in provisions, and provisions for small manufacturers. The addition of this section is necessary to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations. Moreover, changes to subparagraph (a) allow manufacturers to generate emission credit for 2013 and earlier model year compliance, equivalent to the federal ABT program. This change is necessary in order to establish an equivalent California ABT program to the federal ABT program.

Section 1037.201

This section describes the general requirements for obtaining a certificate of conformity (or Executive Order), and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.205

This section describes the information that must be included in a certification application, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations. Moreover, changes made to subparagraph (r) are needed in order to reference California regulatory authority when a manufacturer submits its application.

Section 1037.210

This section describes the process to provide preliminary approval before submitting an application for certification, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.220

This section describes the process to amend maintenance instructions, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.225

This section contains the procedures for amending an application for certification once it has been submitted for certification, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.230

This section contains the instruction for how to select vehicle families, sub-families, and configurations, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.241

This section shows how to demonstrate compliance with the GHG emission standards, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.250

This section describes the reporting and recordkeeping requirements for certification, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.255

This section describes the decisions that ARB may make regarding certification and issuing of an Executive Order, and its addition is

necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.401

This section describes how in-use testing will be performed by U.S. EPA (or ARB), and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.501

This section describes the general testing and modeling provisions, such as the reference for criteria exhaust emission testing, the type of test fuel and use of a standard trailer for testing, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations. In addition, changes are made to subparagraph (d) to specify California test fuels found in the applicable test procedures, and are necessary in order to establish California GHG emission standards and test procedures for heavy-duty vehicles.

Section 1037.510

This section specified how to perform GHG exhaust emission testing for vehicles where such testing is required. GHG emissions are measured when the vehicle is tested on a chassis dynamometer over specified test cycles. The addition of this section is needed in order to establish California GHG test procedures for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.520

This section shows how to use the Greenhouse Gas Emission Model (GEM) to model CO2 emissions to show compliance with the heavy-duty vehicle GHG emission standards. Inputs, such as coefficient of aerodynamic drag and tire rolling resistance, are determined by the manufacturer and are entered into the GEM to show vehicle emission compliance. The addition of this section is needed in order to establish California GHG emission standards and test procedures for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.521

This section describes how to determine the aerodynamic drag area of the test vehicle using a coastdown or alternate procedure. The addition of this section is needed in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.525

This section describes the procedure for quantifying the reduction in GHG emissions as a result of running power take-off devices on a hybrid-electric vehicle. The addition of this section is needed in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.550

This section describes the procedure for simulating a chassis test with a post-transmission hybrid system to determine the emission credit given to innovative technologies. The addition of this section is needed in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.
Section 1037.601

This section contains compliance provisions for engine and vehicle manufacturers as well as owners, operators, and rebuilders of engines, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations. In addition, changes are made to subparagraphs (c) and (d) to delete references to federal law and to replace them with the applicable California law. These changes are necessary to establish California authority for compliance provisions.

Section 1037.610

This section specifies the provisions for generating innovative technology credits of vehicle technologies that were not in common use with heavy-duty vehicles before 2010 model year that are not reflected in the GEM simulation tool. Its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations. In addition, changes are made to subparagraph (e) to remove the reference to 40 CFR 86.1866 and are necessary because this federal reference is not applicable to California law.

Section 1037.615

This section describes how to generate advanced technology-specific emission credits for hybrid electric vehicles with regenerative braking, vehicles with Rankine-cycle engines, and electric vehicles. Its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.620

This section specifies how manufacturers may introduce partially complete vehicles into commerce, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.630

This section describes how a vehicle manufacturer may reclassify certain tractors as vocational tractors, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.631

This section provides an exemption from the GHG standards for certain vocational vehicles intended to be used extensively in off-road environments, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.640

This section specifies provisions that apply for vehicle speed limiters that are modeled in the GEM simulation tool, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.645

This section describes the provisions to apply a higher in-use FEL for certain in-use vehicles, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.650

The section describes the requirements of tire manufacturers that choose to provide test data or emission warranties to the vehicle manufacturer, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.655

This section specifies vehicle modifications that may occur after a vehicle reaches the end of its regulatory useful life, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.660

This section specifies requirements that apply for certified automatic engine shutdown systems that are modeled in the GEM simulation tool, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations. Moreover, the addition of subparagraph B describes how to comply with existing California requirements for automatic engine shutdown systems. The addition of this subparagraph is needed to conform section 1037.660 to existing California requirements for automatic engine shutdown systems.

Section 1037.701

This section describes the general provisions of the ABT program, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.705

This section contains the provisions for calculating emission credits for each GHG pollutant in the ABT program, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.710

This section specifies how to average emission credits for an averaging set in the ABT program, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.715

This section specifies how to bank excess credits in the ABT program, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.720

This section specifies how to trade excess emission credits between manufacturers, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.725

This section describes the information to include in the application for certification if the manufacturer participates in the ABT program, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.730

This section describes the requirements to submit end-of-year and final reports if the manufacturer participates in the ABT program, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.735

This section describes the recordkeeping provisions for manufacturers, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.740

This section specifies the restrictions for using emission credits, such as defining the averaging set, applying credits to prior year deficits, credits from hybrid electric vehicles and other advanced technologies, and credit life. The addition of this section is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.745

This section contains the provisions for remedying end-of-year CO2 credit deficits, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.750

This section specifies the consequences for not complying with the provisions of this subpart, such as voiding the Executive Order, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.801

This section contains the definitions that apply to this part and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations. Moreover, the addition of subsection B. is needed to incorporate California-specific definitions into these test procedures.

Section 1037.805

This section explains the symbols, acronyms, and abbreviations that are used in this part, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.810

This section describes the material that is incorporated by reference in Part 1037, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations.

Section 1037.815

This section references existing provisions to apply for submitted information to be considered confidential, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations. Moreover, deletion and replacement of the paragraph is needed in order

to reference California regulatory authority to consider confidential information.

Section 1037.820

This section contains the requirements for requesting a hearing, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations. Moreover, the changes to subparagraphs (a) and (c) are needed in order to reference California regulatory authority to request a hearing.

Section 1037.825

This section describes the reporting and recordkeeping requirements of the manufacturer, and its addition is necessary in order to establish California GHG emission standards for heavy-duty vehicles and for harmonization with federal Phase 1 GHG regulations. Moreover, the deletion of subparagraph (e) results in the removing the requirements of the Paperwork Reduction Act and is needed because this Act is not part of California law.

Appendix I to Part 1037

This appendix contains the second by second versus vehicle velocity trace of the heavy-duty transient chassis test cycle, and its addition is necessary for testing the vehicle to determine compliance with the GHG emission standards.

Appendix II to Part 1037

This appendix contains the power take-off test cycle for utility and refuse trucks, and its addition is necessary for testing the vehicle to determine compliance with the GHG emission standards.

Appendix III to Part 1037

This appendix identifies abbreviations for emission control system labels, and its addition is necessary for properly complying with the emission label requirements of these HDV TPs.

Part 1066

Section 1066.1

This section describes the applicability of this part to model year 2014 and later heavy-duty on-road vehicles that are not subject to chassis testing for exhaust emission, i.e., vehicles with engines that were engine-certified. The addition of this section is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.2

This section describes the information and statements required in the application for certification that pertain to vehicle testing, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations. Moreover, changes are made to subparagraphs (b) and (f) to delete the references to federal statutes. Furthermore, in subparagraph (e), a reference to the California statutes is added for provisions related to confidential information. These changes are necessary for consistency with California statutes.

Section 1066.5

This section provides an overview of this part and its relation to the standard-setting part (part 1037) for testing various categories of vehicles, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.10

This section generally describes other procedures that the manufacturer and regulatory agency may use for testing, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.15

This section outlines the procedures to test vehicles that are subject to vehicle emission standards, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.20

This section discusses the units of measure used throughout the test procedures, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.25

This section describes the recordkeeping provisions, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.101

This section provides an overview of test equipment, test fuels, and analytical gas for heavy-duty vehicle testing. Its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations. In addition, changes are made to subparagraph (b) to refer to the California test procedures for diesel and Otto-cycle engines. The addition of these changes is needed for establishing California test procedures.

Section 1066.201

This section describes an overview of the dynamometer provisions in this subpart, its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.210

This section describes the specifications of the chassis dynamometer, such as accuracy and precision, test cycle simulation ability, and component requirements, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.215

This section describes the overall process for verifying and calibrating the performance of chassis dynamometers, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.220

This section describes the linearity verification required upon initial installation of the chassis dynamometer, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.225

This section describes the verification procedure for roll runout and roll diameter of the chassis dynamometer upon initial installation and after major maintenance, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.230

This section describes how to verify the accuracy of the dynamometer's timing device upon initial installation and after major maintenance, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.235

This section describes how to verify the accuracy and resolution of the dynamometer speed determination upon initial installation and after major maintenance, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.240

This section references 40 CFR 1065.30 to calibrate torque-measurement systems and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.245

This section describes how to verify the dynamometer's response time upon initial installation and after major maintenance, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.250

This section describes how to verify the dynamometer's base inertial upon initial installation and after major maintenance, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.255

This section describes how to verify and correct the dynamometer's parasitic loss upon initial installation, within 7 days of testing, and after major maintenance, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.260

This section describes how to verify the accuracy of the dynamometer's friction compensation upon initial installation, within 7 days of testing, and after major maintenance, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.265

This section describes how to verify the dynamometer's ability to achieve targeted acceleration and deceleration rates upon initial installation and after major maintenance, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.270

This section describes how to use force measurements to verify the dynamometer's settings based on coastdown procedures upon initial installation, within 7 days of testing, and after major maintenance, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.280

This section specifies the use of good engineering judgment to provide a driver's aid, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.301

This section describes coastdown procedures to determine the load coefficients for the simulated road load equation, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.310

This section describes coastdown procedures that are unique to heavy-duty vehicles, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.401

This section provides an overview of the vehicle preparation and conducting an emission test, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.407

This section describes steps to take before measuring exhaust emissions for vehicles that are subject to evaporative or refueling emission tests, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.410

This section describes how to run the test cycle on the dynamometer, such as cooling fan specifications and recording the vehicle speed trace, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.420

This section describes the pre-test verification procedures and the pre-test data collection, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.425

This section describes the vehicle's engine starting and restarting procedures, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.430

This section describes how to perform the emission tests, such as the prescribed sequence of fueling, parking, and driving at specified test conditions, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.501

This section describes how to correct emission results for the net energy change of the energy storage systems in hybrid electric vehicles, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.601

This section provides an overview of this subpart for calculations, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.610

This section describes how to calculate the total mass-based and molar-based GHG exhaust emissions over a test cycle, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations.

Section 1066.701

This section defines the terms used in this part, and its addition is necessary for establishing vehicle certification test procedures and for harmonization with federal Phase 1 GHG regulations. In addition, the change to add the definition of "EPA" to mean the "ARB or Executive Officer" is needed to give ARB the same authority as EPA in executing these heavy-duty test procedures.

Section 1066.705

This section explains the symbols, acronyms, and abbreviations that are used in this part, and its addition is necessary for harmonization with federal Phase 1 GHG regulations.

Section 1066.710

This section describes the material that is incorporated by reference in Part 1066, and its addition is necessary for harmonization with federal Phase 1 GHG regulations.

B. Tractor-Trailer GHG Regulation Amendments

The proposed amendments to the Heavy-Duty Vehicle Greenhouse Gas Emission Reduction Regulation (also known as the Tractor-Trailer GHG regulation) are primarily designed to harmonize the tractor-related requirements of the Tractor-Trailer GHG regulation with the requirements of the Phase 1 regulations[1]. This section discusses the requirements and the rationale for each provision of the proposed amendments to the Tractor-Trailer GHG regulation.

Subarticle 1: Heavy-Duty Vehicle Greenhouse Gas Emission Reduction Regulation

Section 95300 Purpose

Summary of Section 95300.

Existing section 95300 is modified to clarify the purpose of the regulation.

Rationale of Section 95300

The change is needed to reaffirm and clarify the objectives of the regulation consistent with the longstanding expressed intent when the regulation was first adopted and subsequently amended.

Section 95301. Applicability

[1] *"Phase 1 regulations"* refers to both the 2014 MY National Heavy-Duty Engine Greenhouse Gas Program, as adopted by the U.S. EPA (76 Fed. Reg. 57106 (September 15, 2011)); and the Greenhouse Gas Emission Requirements for New 2014 and Subsequent Model Heavy-Duty Vehicles, as adopted by the California Air Resources Board, sections 95660 to 95664, Subarticle 12, title 17, California Code of Regulations. A *"Phase 1 certified tractor"* is a tractor certified to either the 2014 MY National Heavy-Duty Engine Greenhouse Gas Program or the Greenhouse Gas Emission Requirements for New 2014 and Subsequent Model Heavy-Duty Vehicles.

Summary of Section 95301(b).
Existing section 95301 is modified to clarify the vehicles exempted from this subarticle.

Rationale of Section 95301(b).
The change is needed for clarity. The existing language lists trailer types and vehicles that are exempt, but does not clearly state that the tractors that pull them are also exempt.

Section 95302. Definitions

Summary of Section (a)(19.1)
New section (a)(19.1) is added to provide a definition of "emission standard."

Rationale of Section (a)(19.1)
The addition of this definition is needed to clarify that the Tractor-Trailer GHG regulation includes emission standards. The definition revises the definition set forth at Health and Safety Code section 39027 consistent with the express authorization of the Board to make such a revision in Health and Safety Code sections 39010 and 39601.

Summary of Section (a)(19.2)
New section (a)(19.2) is added to provide a definition of "evaporative emission standards."

Rationale of Section (a)(19.2)
The addition of this definition is needed to identify a subcategory of the new definition of emission standard that had previously been identified merely as an emission standard.

Summary of Section (a)(19.3)
New section (a)(19.3) is added to provide a definition of "exhaust emission standards or tailpipe emission standards."

Rationale of Section (a)(19.3)
The new proposed definition is needed to identify a subcategory of the new definition of emission standard that had previously been identified merely as an emission standard.

Summary of Section 95302(a)(43.1).
New section 95302(a)(43.1) is added to provide a definition of "Phase 1 Certified Tractor."

Rationale of Section 95302(a)(43.1).
This definition of a "Phase 1 Certified Tractor" is needed because new section 95305(m) exempts these tractors from the requirements of section 95303(a).

Summary of Section 95302(a)(53).
Existing section 95302(a)(53) is modified to change the definition of "sleeper cab" to "sleeper-cab tractor", which is defined as a heavy-duty tractor originally manufactured with a tractor body that has a sleeping compartment.

Rationale of Section 95302(a)(53).
The change is needed to clarify that a heavy-duty tractor originally manufactured without a sleeper cab, and subsequently retrofitted with a sleeper cab, is not considered a sleeper-cab tractor for purposes of this regulation.

Section 95303. Requirements and Compliance Deadlines

Summary of Section 95303(a)(1).
Existing section 95303(a)(1) is modified to limit the applicability of this section to 2011 through 2013 MY sleeper cab tractors. The term "sleeper-cab HD tractor" is replaced with the term "sleeper-cab tractor."

Rationale of Section 95303(a)(1).
The changes are needed to both harmonize the requirements of this regulation with the requirements of the Phase 1 regulations, which establish GHG certification emission standards for 2014 and subsequent tractors, and to reflect the changes to section 95302(a)(53) discussed above.

Summary of Section 95303(a)(2).
Existing section 95303(a)(2) is modified to limit the applicability of this section to 2011 through 2013 MY heavy-duty tractors. The term "sleeper-cab heavy-duty tractor" is replaced with the term "sleeper-cab tractor."

Rationale of Section 95303(a)(2).
The changes are needed to both harmonize the requirements of this regulation with the requirements of the Phase 1 regulations, which establish GHG certification emission standards for 2014 and subsequent tractors, and to reflect the changes to section 95302(a)(53) discussed above.

Section 95305. Exemptions

Summary of Section 95305(a).
Existing section 95305(a) is modified to remove the phrase "To qualify, the following must be met."

Rationale of Section 95305(a).
The change is needed for clarity to remove superfluous and inaccurate language.

Summary of Section 95305(a)(1).
Existing section 95305(a)(1) is modified by adding the phrase ", as applicable,."

Rationale of Section 95305(a)(1).
The change is needed to clarify that the requirements of sections 95303(a)(1), 95303(a)(2), and 95303(a)(3) do not apply to all short-haul tractors.

Summary of Section 95305(a)(9).
New section 95305(a)(9) is added to clarify that a 2014 or subsequent MY tractor can be registered as a short-haul tractor.

Rationale of Section 95305(a)(9).
The new section is added to remove any uncertainty as to whether a 2014 or subsequent model tractor is eligible for registration as a short-haul tractor.

Summary of Section 95305(b)(1).
Existing section 95305(b)(1) is modified by adding the phrase ", as applicable,."

Rationale of Section 95305(b)(1).
The change is needed to clarify that the requirements of sections 95303(a)(1), 95303(a)(2), and 95303(a)(3) do not apply to all local-haul tractors.

Summary of Section 95305(b)(8).
New section 95305(b)(8) is added to clarify that a 2014 or subsequent MY tractor can be registered as a local-haul tractor.

Rationale of Section 95305(b)(8).
The new section is added to remove any uncertainty as to whether a 2014 or subsequent model tractor is eligible for registration as a local-haul tractor.

Summary of Section 95305(d)(1).
Existing section 95305(d)(1) is modified by adding the phrase ", as applicable,."

Rationale of Section 95305(d)(1).
The change is needed to clarify that the requirements of sections 95303(a), and 95303(b) do not apply to all drayage tractors.

Summary of Section 95305(f)(1)(A).
Existing section 95305(f)(1)(A) is modified to add the phrase "that is located further than 100 miles from its current local-haul base."

Rationale of Section 95305(f)(1)(A).
The change is needed to clarify that a registered local-haul trailer traveling under a Relocation Pass to a new local-haul base, may only do so if the new local-haul base is located further than 100 miles from the old local-haul base. This was the intent of the original language.

Summary of Section 95305(m).
New section 95305(m) is added to exempt 2013 MY Phase 1 Certified Tractors from the requirements of section 95303(a).

Rationale of Section 95305(m).
Although the Phase 1 regulations establish GHG certification emission standards for 2014 and subsequent MY tractors, some tractor manufacturers may elect to certify 2013 MY tractors to these standards to obtain early compliance credits. Without the exemption, those Phase 1 certified 2013 MY tractors would be subject to both the Phase 1 regulations and the amended Tractor-Trailer GHG regulation. To harmonize the requirements of both regulations, the exemption is needed.

C. Proposed Optional NOx Standards

The primary purpose of the proposed amendments to the Title 13, section 1956.8 and the diesel and Otto cycle standards and test procedures listed is to give ARB a mechanism in place to allow heavy-duty engine manufacturers to optionally certify engines to standards more stringent than the 2010 model year standard. The proposed regulation contains the next generation of optional NOx standards for heavy-duty engines, three optional NOx emission standards of 0.1 g/bhp-hr, 0.05 g/bhp-hr, and 0.02 g/bhp-hr (i.e., 50 percent, 75 percent, and 90 percent lower than the current mandatory standard). Under staff's proposal, manufacturers could choose whether to certify to one of the optional NOx levels or to certify to the mandatory 0.2 g/bhp-hr standard. This section discusses the proposed modifications and the rationale for each modification to the following regulations.

- Title 13, section 1956.8 Exhaust Emission Standards and Test Procedures – 1985 and Subsequent Model Heavy-Duty Engines and Vehicles,
- California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles, and
- California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines

Title 13, section 1956.8 - Exhaust Emission Standards and Test Procedures – 1985 and Subsequent Model Heavy-Duty Engines and Vehicles

Section (a)(2)(A) Table: Exhaust Emission Standards for 2004 and Subsequent Model Heavy-Duty Engines, and Optional, Reduced Emission Standards for 2002 and Subsequent Model Heavy-Duty Engines Produced Beginning October 1, 2002, Other than Urban Bus Model-Year Engines produced from October 1, 2002 Through 2006
This table has been amended to include 2015 and subsequent model years and a column which includes Optional Oxides of Nitrogen standards at 0.1 g/bhp-hr, 0.05 g/bhp-hr, and 0.02 g/bhp-hr. Two footnotes were added. The first is footnote "N" which explains that a manufacturer may choose to offer an engine that is 50 percent, 75 percent, or 90 percent below the current 0.20 g/bhp-hr engine emission standard. The second added footnote is footnote "O" which describes the On Board Diagnostic (OBD) requirements can be found in 13 CCR 1971.1 and 1971.5. In addition, a manufacturer may request Executive Officer approval of manufacturer-proposed malfunction criteria instead of the OBD regulation requirements if specific criteria are met. For example, the manufacturer must use good engineering judgment. The malfunction criteria must provide similar timeliness in detection of malfunctioning systems as on a medium-duty diesel vehicles certified on a dynamometer. The malfunction criteria must be set as stringently as technologically feasible, but not lower than 1.5 times the chassis dynamometer standard to which the engine is certified. All the while, the manufacturer should consider the best available monitoring technology. The malfunction criteria must work for the components it is designed to work with for the full useful life. The manufacturer must provide emission data showing emission levels where the malfunctions are detected.

Section (c)(1)(B) Table: California Emission Standards for 2005 and Subsequent Model Heavy-Duty Otto-Cycle Engines
This table has been amended to correct certain existing footnotes labels that were incorrect. In a previous rulemaking that amended this table, a footnote (B) was added, resulting in subsequent footnotes to be relettered. However, in the previous rulemaking, several footnote labels in the table were not updated to account for this reletterring.

This table has also been amended to include model years 2015 and subsequent to include Optional Oxides of Nitrogen standards at 0.1 g/bhp-hr, 0.05 g/bhp-hr, and 0.02 g/bhp-hr. In addition the emission category now includes "optional".

Footnote F
This footnote clarifies that engines certified to optional low NOx emission standards cannot be used to generate averaging, banking, and trading (ABT) credits.

Footnote N
This footnote explains that a manufacturer may choose to offer an engine that is 50 percent, 75 percent, or 90 percent below the current 0.20 g/bhp-hr engine emission standard.

Footnote O
This footnote describes that OBD requirements can be found in 13 CCR 1971.1 and 1971.5. A manufacturer may request Executive Officer approval of manufacturer-proposed malfunction criteria instead of the OBD regulation requirements if specific criteria delineated in this footnote are met.

California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles

Section B California Provisions
This section defines optional low NOx engine as a 2015 and subsequent model heavy-duty diesel engine certified to the optional low NOx emission standards, which are below the 0.20 g/bhp-hr emission standard for 2007 and subsequent model engines. The optional low NOx engine emission standards are 0.10, 0.05, and 0.02 g/bhp-hr.

Section B7 Table
Optional low NOx standards are inserted in this table; this table also identifies additional exhaust emission standards for non-methane hydrocarbon (NMHC), carbon monoxide (CO), and particulate matter (PM).

Section 2. §86.007-15 California Provisions 2.
Inserted that optional low NOx engines shall not be used to generate credits in the ABT program.

Section 17.
OBD shall be installed on all engines used in applications less than or equal to 14,000 pounds GVWR.

Section 18.
This section states that OBD must be installed on all engines used in applications greater than 14,000 pounds GVWR.

Section 35. Labeling B California Provisions
This section states that engine manufacturers that choose to certify an engine to one of the optional low NOx emission standards must label the engine as

follows: "This engine confirms to California regulations applicable to XXXX model year heavy-duty diesel engines and is certified to the Optional Low NOx Engine emission standard of XXX g/bhp-hr."

California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles

Section B. California Provisions
This section defines optional low NOx engine as a 2015 and subsequent model heavy-duty otto-cycle engine certified to the optional low NOx emission standards, which are below the 0.20 g/bhp-hr emission standard for 2007 and subsequent model engines. The optional low NOx emission standards are 0.10, 0.05, or 0.02 g/bhp-hr.

Section B. 1.
This table has been amended to correct certain existing footnotes labels that were incorrect. In a previous rulemaking that amended this table, a footnote (B) was added, resulting in subsequent footnotes to be relettered. However, in the previous rulemaking, several footnote labels in the table were not updated to account for this reletterring.

In addition, optional low NOx standards are inserted in this table; this table also identifies additional exhaust emission standards for non-methane hydrocarbon (NMHC), carbon monoxide (CO), and particulate matter (PM).

Section B. 1. Footnote F
This footnote states that ABT does not apply to optional low NOx emission standard engines.

Section B. 1. Footnote I
This footnote states that engine manufacturers may choose to produce heavy-duty engines that emit less NOx than standard 0.20 g/bhp-hr engines.

Section 15. B. California Provisions
Inserted that optional low NOx engines shall not be used to generate credits in the ABT program.

Section 35. B. 2. California Provisions
This section states that engine manufacturers that choose to certify an engine to one of the optional low NOx emission standards must label the engine as follows: "This engine confirms to California regulations applicable to XXXX model year heavy-duty Otto-cycle engines and is certified to the Optional Low NOx Engine emission standard of XXX g/bhp-hr."

D. Anti-Idling Amendments

The primary purpose of the proposed amendments to the idling ATCM, 13 CCR 2485, is to extend the applicability of the regulation to include vehicle owners and motor carriers that dispatch affected vehicles to share some of the responsibilities of compliance with the existing requirements of the regulation. This section discusses the proposed modifications and the rationale for each modification to the idling ATCM.

Section 2485(a) Purpose

The "Purpose" clause of the regulation has been amended to reaffirm and clarify the objectives of the regulation consistent with the longstanding expressed intent when the regulation was first adopted and subsequently amended.

Section 2485(b) Applicability

Existing subsection 2485(b) specifies the applicability of the regulation to the vehicle driver only.

The modifications to this subsection would expand the applicability of the regulation to include any person, business, or government entity that owns, operates, or causes to operate diesel-fueled commercial motor vehicles and alternative idle reductions technologies installed on these vehicles. This would include drivers, owners, and motor carriers.

Subsection (b)(2)

The existing applicability section specifies only diesel-fueled commercial motor vehicles to be subject to the requirements of the regulation. Although, the existing regulation includes emission performance requirements applicable to alternative idle reduction technologies, these technologies are not included in the applicability section. Subsection (b)(2) would clarify the applicability section by adding alternative idle reductions technologies as equipment subject to the requirements of this section. However, the proposed amendments do not impose any new requirements to alternative idle reduction technologies.

Section 2495(c) Requirements

Subsections (c)(1)(A) and (c)(1)(B)

Currently, subsection (c)(1) specifies that the driver shall comply with the existing idling restriction requirements as of January 1, 2008. However, the proposed amendments would extend the applicability to the owner and motor carrier effective January 1, 2015.

Because of the mismatch between the effective date in the existing regulation applicable to the driver and the new effective date in the proposed amendments applicable to the owner and motor carrier, the existing driver requirements in subsection (c)(1), now referenced as (c)(1)(A), is modified to expire by January 1, 2014 and a new subsection (c)(1)(B) is added that would specify the requirements to any person including the driver, owner and motor carrier effective January 1, 2015. Subsection (c)(1)(B) would impose the existing requirements not only to the driver, but also to the owner and motor carrier to comply with the vehicle and diesel-fueled APS idling restriction requirements beginning January 1, 2015.

Subsection (c)(1)(C)

Subsection (c)(1)(C) is new and would require the vehicle driver subject to the requirements of the regulation to provide to enforcement personnel his or her driver's license, vehicle registration, and business name and contact information of the motor carrier that is dispatching the vehicle. These information is needed for the purposes of issuing citations to one or all of the responsible parties (the driver, vehicle owner, and motor carrier) when a violation of the regulation occurs.

Subsection (c)(1)(D)

This is also a new subsection and would require the motor carrier to provide his or her business name and contact information to the dispatched driver. This would be needed because when a violation of the regulation occurs, the driver would be required to provide to enforcement personnel the motor carrier's name and contact information.

Subsections (c)(2)(A), (c)(2)(B), and (c)(2)(C)

Currently, subsection (c)(2)(A), (c)(2)(B), and (c)(2)(C) specify that the driver shall not operate non-compliant vehicles and non-compliant alternative idle reduction technologies beginning January 1, 2008. However, the proposed amendments would extend the applicability to the owner and motor carrier effective January 1, 2015.

Because of the mismatch between the effective date in the existing regulation applicable to the driver and the new effective date in the proposed amendments applicable to the owner and motor carrier, the existing driver requirements in subsection (c)(2)(A), (c)(2)(B), and (c)(2)(C) are modified to expire by December 31, 2014 and a new subsection (c)(2)(D) is added that is applicable to any person including the driver, owner and motor carrier effective January 1, 2015. Subsection (c)(2)(D) would impose the existing requirements not only to the driver, but also to the owner and motor carrier to

comply with the vehicle and alternative idle reduction requirements beginning January 1, 2015.

Subsections (c)(2)(D)

This is a new subsection that is added to require any person including the driver, vehicle owner, and motor carrier that dispatched the vehicle to comply with the existing diesel-fueled APS and fuel-fired heater requirements beginning January 1, 2015 (see above for rationale). This subsection would replace subsections (c)(2)(A), (c)(2)(B), and (c)(2)(C) effective January 1, 2015.

Subsection (c)(3)

"Idle Reduction Technology" is added to the subtitle of subsection (c)(3) to add clarity to the subsection's applicability. In addition, the term "diesel engines/vehicles" was modified to "diesel-fueled engines/vehicles" to add clarity and make it consistent with the term used in the rest of the regulatory language. Also, for clarity purposes the term "(c)(3)" is added to the existing references "(A)", "(B)", and "(C)".

Subsection (c)(3)(B)

The modification to subsection (c)(3)(B) updates the title of the test procedures document for fuel-fired heaters incorporated by reference in 13 CCR 1961(d). The existing title "California Exhaust Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light Duty Trucks, and Medium-Duty Vehicles" was replaced by "California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles" to reflect the recent changes made to the light duty vehicle exhaust emission standards and test procedures, incorporated by reference in 13 CCR 1961(d). The modification does not impose any new requirements to fuel-fired heaters.

Subsection (d) Exceptions

Subsection (d)(1) is modified to include the applicability of the exceptions to the new subsection (c)(1)(B)(1) which would extend the compliance requirements to owners and motor carriers.

Subsection (d)(2)(H)

This subsection is modified to add the word "diesel" between the words "primary" and "engine." This modification is made for clarity and consistency purposes.

Subsection (e) Relationship to Other Laws

Subsection (e)(2)

In this subsection, the capitalization of the words "title" and "section" were changed for consistency purposes. In addition, for consistency purposes, "California Code of Regulations" was replaced by its acronym "CCR" which was first defined in subsection (b)(2)(A)2.

Subsection (e)(3)

Subsection (e)(3) is new and is added to indicate the relationship that exists between this regulation (13 CCR 2485) and the heavy-duty diesel engine standards specified in 13 CCR 1956.8. 13 CCR 1956.8 specifies idling emission standards for new heavy-duty diesel engines.

Subsection (e)(4)

In this subsection, the capitalization of the word "section" was changed for consistency purposes.

Subsection (g) Penalties

The modification to this subsection adds an expiration date of January 1, 2015 to the existing penalties section applicable to the driver. A new paragraph is added that specifies the penalties applicable to any person beginning January 1, 2015. The new paragraph also provides Health and Safety code citations under which penalties may be assessed for violations with the requirements of this regulation.

Subsection (h) Definitions

Subsection (h)(7)

The proposed addition of the definition "Emission standards" is needed to clarify that the idling ATCM includes emission standards. The definition revises the definition set forth at Health and Safety Code section 39027 consistent with the express authorization of the Board to make such a revision in Health and Safety Code sections 39010 and 39601.

Subsection (h)(8)

The proposed addition of the definition of "Evaporative emission standards" is needed to identify a subcategory of the new definition of emission standard that had previously been identified merely as an emission standard.

Subsection (h)(9)

The proposed addition of the definition "Exhaust emission standards" or "tailpipe emission standards" is needed to identify a subcategory of the new definition of emission standard that had previously been identified merely as an emission standard.

Subsection (h)(10)
The existing subsection does not include a definition for Executive Officer although it is referenced in subsection (c)(3)(D).

The proposed modifications would add a definition to Executive Officer (subsection (h)(10)). The proposed amendments would also define new terms introduced in the proposed amendment such as "motor carrier" (subsection (h)(15)), "owner" (subsection (h)(19)), and "person" (subsection (h)(20)). Furthermore, the proposed amendments would modify the definition of "restricted area" to include "schools", "hotels", and "motels" (subsection (h)(23)).

In subsections (h)(1), (h)(2), (h)(4), (h)(5), (h)(6), (h)(12), (h)(13), (h)(17), (h)(18), and (h)(26), the word "California" is added to "Vehicle Code" to clarify that "Vehicle Code" refers to "California Vehicle Code".

In subsections (h)(4), (h)(25), and (h)(27), "California Code of Regulations" is replaced by its acronym "CCR" for consistency purposes.

Subsection (i) Severability
Staff is adding a new subsection, "Severability", to indicate that if for any reason a portion of the section becomes invalid by a court, then that portion would be considered a separate provision and such decision would not affect the validity of the remaining portions of the sections.

E. Heavy-Duty Hybrid-Electric Vehicles Certification Procedures

Amendments to Section A

Summary

This section states the applicability of the certification procedures. This section was amended to revise the applicability and reference dates.

Rationale

These changes are needed to clarify that these procedures are applicable to other hybrid vehicles, in addition to hybrid-electric urban buses, and to specify the applicable condition and vehicle weight rating for these vehicles. Additional changes were also made to update the dates of referenced sections of the California Code of Regulations and last amended date of the interim test procedures.

Amendments to Section B

Summary

This section states the definitions and abbreviations of the certifications procedures as incorporated in various references. Certain existing definitions were modified and new definitions were added.

Rationale

These changes are needed to increase clarity and consistency or to expand the scope of the interim test procedures and to incorporate new references and latest amendment dates.

1. "Auxiliary Power Unit" The proposed addition of the word "flywheels" to this definition is necessary to clarify that flywheels are included in the examples. Additionally, the acronym "APU" was deleted to clarify that "APU" refers to "auxiliary power unit" and was reformatted for consistency with other definitions.

2. "Average Loaded Vehicle Weight" This new proposed definition is needed to complement the amendments to the vehicle preparation requirements, where this definition is used. Additionally, it has been added to be consistent with the definition contained in the latest version of "SAE J2711, Recommended Practice for Measuring Energy Consumption of Conventional and Hybrid Heavy-Duty Vehicles Using a Chassis Dynamometer".

3. "Baseline Conventional Engine" This new proposed definition is needed to understand the terminology where it is used such as, but not limited to, the calculation of emission factor.

4. "Baseline Hybrid-Electric Drive System Engine" This definition has been modified because of the expansion of applicable hybrid vehicles. Additionally, it was reformatted for consistency with other definitions.

5. "Baseline Vehicle" This new proposed definition has been modified because of the expansion of applicable hybrid vehicles. Additionally, has been modified to add flexibility in determining a representative baseline vehicle.

6. "Battery" There is no change to this definition.

7. "Battery Current Throughput" This new proposed definition is needed to complement the amendments to the test procedure requirements. Additionally, it has been added to be consistent with the definition contained in the latest version of "SAE J2711, Recommended Practice for Measuring Energy Consumption of Conventional and Hybrid Heavy-Duty Vehicles Using a Chassis Dynamometer".

8. "Battery Rated Ampere-hour Capacity" This definition has been reformatted for consistency with other definitions. No substantive changes were made.

9. "Battery State of Charge" The acronym "SOC" and "Ah" were deleted to clarify that "SOC" refers to "state of charge" and "Ah" refers to Ampere-hours respectively.

10. "Capacitor" There is no change to this definition.

11. "Capacitor State of Charge" The acronym "SOC" was deleted to clarify that "SOC" refers to "state of charge".

12. "CCR" There is no change to this definition.

13. "CFR" There is no change to this definition.

14. "Charge-Depleting Actual Range (Rcda)" This new proposed definition is needed to complement the amendments to the test procedures. Additionally, it has been added to align with the definition contained in the latest version of "SAE J2711, Recommended Practice for Measuring Energy Consumption of Conventional and Hybrid Heavy-Duty Vehicles Using a Chassis Dynamometer" and "California Exhaust Emission Standards and Test Procedures for 2009 through 2017 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes".

15. "Charge-Depleting Cycle Range (Rcdc)" This new proposed definition is needed to complement the amendments to the test procedures. Additionally, it has been added to align with the definition contained in the latest version of "SAE J2711, Recommended Practice for Measuring Energy Consumption of Conventional and Hybrid Heavy-Duty Vehicles Using a Chassis Dynamometer" and "California Exhaust Emission Standards and Test Procedures for 2009 through 2017 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes".

16. "Charge-Depleting Hybrid-Electric Vehicle" This definition has been modified because of the expansion of applicable hybrid vehicles. Additionally, the acronym "RESS" was spelled out to clarify that "RESS" refers to "rechargeable energy storage system".

17. "Charge-Depleting Mode" This new proposed definition is needed to complement the amendments to the test procedures. Additionally, it has been added to be consistent with the definition contained in the latest version of "SAE J2711, Recommended Practice for Measuring Energy Consumption of Conventional and Hybrid Heavy-Duty Vehicles Using a Chassis Dynamometer".

18. "Charge-Sustaining Hybrid-Electric Vehicle" This definition has been modified because of the expansion of applicable hybrid vehicles. Additionally, the acronym "RESS" was spelled out to clarify that "RESS" refers to "rechargeable energy storage system".

19. "Charge-Sustaining Mode" This new proposed definition is needed to complement the amendments to the test procedures. Additionally, it has been added to be consistent with the definition contained in the latest version of "SAE J2711, Recommended Practice for Measuring Energy Consumption of Conventional and Hybrid Heavy-Duty Vehicles Using a Chassis Dynamometer".

20. "Consumable Fuel" This new proposed definition is needed to complement the amendments to the test procedures requirements. Additionally, it has been added to align with the definition contained in the latest version of "SAE J2711, Recommended Practice for Measuring Energy Consumption of Conventional and Hybrid Heavy-Duty Vehicles Using a Chassis Dynamometer" and "California Exhaust Emission Standards and Test Procedures for 2009 through 2017 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes".

21. "Curb Weight" This new proposed definition is needed to complement the amendments to the certification and test procedure requirements, where this definition is used. Additionally, it has been added to be consistent with the definition contained in the latest version of "SAE J2711, Recommended Practice for Measuring Energy Consumption of Conventional and Hybrid Heavy-Duty Vehicles Using a Chassis Dynamometer".

22. "Electric Drive Components" This definition has been modified to add the phrase "on board charge" as an example of electric drive components. Additionally, it was reformatted for consistency with other definitions.

23. "Electromechanical Flywheel" This definition has been reformatted for consistency with other definitions. No substantive changes were made.

24. "Electromechanical Flywheel State of Charge" The acronym "SOC" was deleted to clarify that "SOC" refers to "state of charge". Additionally, it was reformatted for consistency with other definitions.

25. "Emission Factor" This definition has been modified because of the expansion of applicable hybrid vehicles. Additionally, it was reformatted for consistency with other definitions.

26. "Emission Factor Ratio" This definition has been modified because of the expansion of applicable hybrid vehicles.

27. "End of Test" This new proposed definition is needed to complement the amendments to the test procedure requirements. Additionally, it has been added to be consistent with the definition contained in the latest version of "SAE J2711, Recommended Practice for Measuring Energy Consumption of Conventional and Hybrid Heavy-Duty Vehicles Using a Chassis Dynamometer".

28. "Flywheel" This new proposed definition is needed to understand the terminology where it is used.

29. "Full Charge Test" This new proposed definition is needed to complement the amendments to the test procedure requirements. Additionally, it has been added to be consistent with the definition contained in the latest version of "SAE J2711, Recommended Practice for Measuring Energy Consumption of Conventional and Hybrid Heavy-Duty Vehicles Using a Chassis Dynamometer".

30. "Gross Vehicle Weight Rating (GVWR)" This new proposed definition is needed to complement the amendments in the applicable hybrid vehicles and to be consistent with the definition contained in the latest amended version of 40 CFR, section 86.1803-01.

31. "Hybrid-Electric Drive System" This definition has been modified to spell out the acronym "APU" which refers to "auxiliary power unit". Additionally, it was reformatted for consistency with other definitions.

32. "Hybrid-Electric Urban Transit Bus (HEB)" This definition has been modified, because previous definition is no longer relevant to the proposed test procedures. The proposed new definition is the same as the hybrid-electric vehicle definition because of the expansion of applicable vehicles.

33. "HEB Family" There is no change to this definition.

34. "Hybrid-Electric Vehicle" This new proposed definition is needed to complement the amendments to the test procedures requirements specifically because the applicable hybrid vehicles are expanded. Additionally, it has been added to align with the definition contained in the latest version of "SAE J2711, Recommended Practice for Measuring Energy Consumption of Conventional and Hybrid Heavy-Duty Vehicles Using a Chassis Dynamometer".

35. "Hybrid Engine Family" This new proposed definition is needed to complement the amendments to the test procedures requirements. Additionally, it has been added to align with the terminology used in the Executive Orders for hybrid vehicle certification.

36. "Net Energy Change" This definition has been modified to delete the acronyms "NEC" and "RESS" and use the spell out the words "net energy change" and "rechargeable energy storage system" respectively for easy identification.

37. "Plug-In Hybrid-Electric Vehicle" This new proposed definition is needed to complement the amendments in the applicable hybrid vehicles and to be consistent with the definition contained in the latest amended version of 40 CFR, section 86.1803-01.

38. "Propulsion Energy" This definition has been modified to spell out "RESS" which refers to "rechargeable energy storage system". Additionally, it was reformatted for consistency with other definitions.

39. "Propulsion System" This definition has been reformatted for consistency with other definitions. No substantive changes were made.

40. "Rechargeable Energy Storage System" This definition has been modified because of the expansion of applicable hybrid vehicles. Additionally, the acronym "RESS" was spelled out to clarify that "RESS" refers to "rechargeable energy storage system".

41. "Regenerative Braking" This definition has been modified to align with the definition contained in "California Exhaust Emission Standards and Test Procedures for 2009 through 2017 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes".

42. "State of Charge" This definition has been modified to include different types of state of charge. Additionally, it has been modified to spell out "state of charge".

43. "State of Charge delta" This definition has been modified to replace the word "delta" to the phrase "the change in" to clarify the definition. Additional unit of measurement are added to be consistent with the other related definitions. Further, the acronym "SOC" was deleted to clarify that it refers to "state of charge".

44. "State of Charge final" The acronyms "SOC" and "Ah" were deleted to clarify that "SOC" and "Ah" refer to "state of charge" and ampere-hours" respectively.

45. "State of Charge initial" The acronyms "SOC" and "Ah" were deleted to clarify that "SOC" and "Ah" refer to "state of charge" and ampere-hours" respectively.

46. "Urban Bus" This new definition is necessary to clarify and be consistent with the definition contained in the latest amended version of 13 CCR 2023.

47. "Total Fuel Energy" This definition has been modified to include the meaning of the acronym (kWh). No substantive changes were made.

Amendments to Section C

The following changes were made to the introductory paragraphs of Section C:

(1) Section title, "Heavy-Duty Hybrid-Electric Drive System and Vehicle Certification Requirements";

(2) First paragraph, "Compliance with the heavy-duty hybrid-electric vehicle criteria pollutant standards requires the development of an emission factor ratio ..." and

(3) Second paragraph, "For 2007 and subsequent model years, only one Executive Order shall be granted identifying the emission standard achieved by the hybrid-electric drive system or vehicle".

The first change is needed to clarify the intent and scope of the certification procedures. The second change is needed to clarify that the procedures are to be used to obtain certification only for criteria pollutants. The third change is needed to clarify that complete heavy-duty hybrid vehicles could be certified using these procedures.

Subsection C.1, "One Party Responsibility", changed from "HEB" to hybrid-electric vehicle. This change is needed to improve readability and to emphasize the applicability of these procedures are not limited to hybrid-electric urban buses.

Subsection C.1.1, "Certification Standards", added new language "All 2007 and subsequent model year hybrid-electric vehicles shall, by model year, meet the exhaust emission standards set forth in title 13, CCR, 1956.8" in addition to other clarification changes already discussed above. The new language is needed to correctly reference the appropriate CCR section for heavy-duty vehicles.

Subsection C.2, "Two Party Responsibility", added new language "For model years 2004 through 2006,..." to emphasize that two-party certification is only allowed for those model year vehicles. Even though that allowance has been sunset, the added language is intended to clarify that historical provision.

Subsection C.2.1, "Certification Standards", delete language "All 2004 and subsequent model year hybrid-electric drive systems shall, by model year, meet the exhaust emission standards or optional emission standards set forth in title

13, CCR, section 1956.1" to eliminate redundancy since this provision is already specified in section C.1.1.

Subsection C.3, "25 Percent reduction Claim" editorial change to correct for section citations.

Subsection C.4, "Useful Life", several changes are made to this section. The first change is "~~After that time~~ For the 2007 and subsequent model years, the useful life of the engine and hybrid-~~electric~~ drive system in a hybrid engine family shall meet the useful life requirements as required for a conventional engine certified to the same intended service class as the hybrid engine family ~~for urban transit buses as~~ set forth in title 13, ...". This change is to clarify that the useful life of the engine certified in a hybrid engine family must meet the useful life of the intended service class of a conventional engine used in a comparable conventional vehicle as intended for the hybrid engine family. This is needed to ensure that the useful life requirements that are specified for a conventional engine in an intended service class also apply to the engine that is certified for a hybrid vehicle application if both engines are certified for the intended same service class. The second change in this subsection is editorial to update for section citations and reference dates.

Subsection C.5, "Emissions Warranty". Changes in this subsection are mainly editorial (non-substantive) and to update reference citation dates.

Subsection C.6, "Durability and Emission Testing". Changes in this subsection are mainly editorial (non-substantive) and to update reference citation dates.

Subsection C.7, "Labeling Requirements". The change in this subsection is needed for editorial (non-substantive) purposes.

Subsection C.7.1. The changes in this subsection are needed for editorial (non-substantive) purposes.

Subsection C.7.2. The changes in this subsection are needed for editorial (non-substantive) purposes.

Subsection C.7.3. The changes in this subsection are needed for editorial (non-substantive) purposes.

Subsection C.7.4. This new section is needed to extend the existing labeling requirements for urban buses to other heavy-duty vehicles and to specify new applicability dates.

Subsection C.8, "Engine Service Manuals and Equipment Maintenance Signals". Changes in this subsection are mainly to update reference citation dates.

Subsection C.9, "Rebuild Provisions and Recordkeeping Requirement". Changes in this subsection are mainly to update reference citation dates.

Subsection C.10, "Information Requirements". The changes in this subsection are to update for 40 CFR, §86.1843-01(c) reference citation and to include additional information that a manufacturer is already required to provide, but was not explicitly provided for in the existing interim certification procedures. The explicit inclusion of the required information in the proposed amendments is intended to clarify those requirements and to assist the manufacturers in understanding what information would be required when they apply for certification of a hybrid vehicle.

Subsection C.12. This section was added to specify that other hybrid vehicles would be subject to the same information requirements as those provided specifically for hybrid-electric vehicles.

Amendments to Section D

Editorial (non-substantive) changes were made to the section title, and SAE J2711 reference along with other editorial changes. In addition, electric and flywheel hybrid vehicles are added to allow for case-by-case evaluation, similar to the requirements for turbine and fuel cell hybrid vehicles under the existing certification procedures.

Subsection D.1.1, "Test Site". New language was added to clarify test site capabilities for cooling the battery that is representative of in-use operation and require that the cooling fan shall be switched off for all key off dwell periods. These changes are needed to ensure that the thermal conditions of the battery when being tested are similar to when it is in actual in-use operation and to prevent laboratory personnel to overcooling the battery during testing. In addition, new language was added to specify that test conditions specified in 40 CFR, Part 86 and Part 1065 shall apply, as appropriate. This is needed to clarify that test sites need to be conformed to the requirements specified in those two parts of 40 CFR.

Subsection D.1.2, "Pre-Test Data Collection". New language was added to include collection of additional data, such as certified engine family, torque, manufacturer, model, lock-up converter. These changes are needed to ensure that the needed data are collected prior to testing. In addition, new language was added to specify that the chassis test laboratory shall be used to measure

actual cycle distance during a test. This change is needed to ensure uniformity in the determination of distance traveled during a test.

Subsection D.1.4, "Vehicle Preparation". Editorial changes were made to update for reference citation date.

Subsection D.1.4.1. New language was added to specify that the rechargeable energy storage system has to be fully recharged prior to testing as well as specifications concerning the charging frequency during the test. This is needed to ensure that the charging conditions of the rechargeable energy storage system during the test resemble the charging conditions under normal operation.

Subsection D.1.4.2. This section was amended to specify the test weight for light heavy-duty, medium heavy-duty and heavy heavy-duty vehicles. This change is needed to supplement the test weight specification for urban buses in the existing interim certification procedures.

Subsection D.1.4.3. This section was amended to require that the manufacturer's recommended tire pressures be used when testing the vehicle on the dynamometer. This change is needed to ensure vehicle parameters as recommended by the vehicle manufacturers are consistently followed by all test facilities.

Subsection D.1.4.5. This section was added to require that all vehicles are to be tested with normal appendages, except for certain items, which need to be removed for safety reasons. This section is needed to align with standard test chassis dynamometer test procedures.

Subsection D.1.4.8. Changes were made in order to ensure a consistent testing process, including replacing the word "may" with the word "shall."

Subsection D.1.4.9. Editorial changes were made to replace the acronym "HEVs" with "hybrid-electric vehicles". This change is needed for better readability.

Subsection D.1.4.10. This section was added to require that the conditions of the battery during testing be monitor to detect possible damages or compromised charging capability and require any abnormalities to be repaired or stabilized prior to continuing with testing. This change is needed to ensure that the battery charging capability is within manufacturer's specifications to ensure that test results are accurate and valid.

Subsection D.1.5, "Chassis Dynamometer Specifications". This section added new language to recommend using a 40 CFR, §1066 compliant chassis

dynamometer, if available. This change is needed to conforms as closely as possible the latest federal test procedures with the recognition that not all chassis dynamometer currently have the capability to be 40 CFR, §1066 compliant.

Subsection D.1.6, "Testing Instrumentation". This section was amended by adding new language that specifies required testing instruments along with accuracy and precision tolerances, detection limits and measurement errors. New language was also added to require the instruments to comply with specifications presented in SAE1634, SAE 2263, SAE 2265, 40 CFR, §86.1309-90, and 40 CFR, Part 1065, as applicable. These changes are needed to ensure that appropriate instruments with acceptable accuracy and precision levels are being used and that the proper use of instruments is being followed via SAE and CFR references, to ensure test results are accurate and repeatable.

Subsection D.2.2. Editorial changes were made to add the words "heavy-duty" to clarify that the specified test cycle is a heavy-duty test cycle and to update the citation reference date. These changes are needed for better clarity and update.

Subsection D.2.2.1. This section was deleted because it is no longer applicable.

Subsection D.2.2.1. This section was re-numbered from "D.2.2.2." due to deletion of subsection D.2.2.1 as discussed above. In addition, editorial (non-substantive) changes were made to this section to improve readability.

Subsection D.2.2.5. This section was deleted because it is already included in another section of the test procedures.

Subsection D.2.3, "Charge-Sustaining Vehicle Evaluation Procedure". This section was added to reference SAE J2711. This change is needed to follow the latest recommended practice from SAE for testing charge-sustaining hybrid vehicles.

Subsection D.2.3, "Charge-Depleting Vehicle Evaluation Procedure". This section was added to reference SAE J2711. This change is needed to follow the latest recommended practice from SAE for testing charge-depleting hybrid vehicles.

Subsection D.2.5.1. This section was amended to specify the cold-soak temperature range and to allow for the use of "good engineering judgment" to comply with the requirements of this section where needed. These changes are needed to require the standard cold soak temperature range is used and to allow for the use of good engineering judgment concerning other parameters specified

in this section that may not be possible to achieve by all testing laboratories due to differences is facility designs and available equipment and instrumentation.

Subsection D.2.6, "Intra-test Pauses". This section was amended to specify the cooling fan be switched off between tow test events. This change is needed to more accurately duplicate real-world conditions that the vehicle would experience and to be consistent with other accepted test procedures and recommended practices.

Subsection D.2.8.4. This section was amended to replace the acronyms with written-out words. These changes are needed to improve readability.

Subsection D.3.1, "Exhaust Emissions and Fuel Economy". This section was amended to specify that the total exhaust emissions of the hybrid-electric vehicle shall be reported as the sum of the emissions from the charge-sustaining portion and the emissions from the non-charge-sustaining portion of the full charge test. This change is needed to be consistent with SAE J2711. Other changes in this section are editorial (non-substantive) and are needed to improve clarity and readability.

Subsection D.3.2, "Fuel Consumption Calculations". This section was added to reference SAE J2711. This change is needed to follow the latest recommended practice from SAE for testing charge-sustaining hybrid vehicles.

Subsection D.3.3, "State of Charge Difference". This section was amended to replace the acronyms with written-out words. These changes are needed to improve readability.

Subsection D.3.4, "Net Energy Change". This section was amended to replace the acronyms with written-out words. These changes are needed to improve readability.

Subsection D.3.4.1, "Batteries". This section was amended to replace the acronyms with written-out words and other editorial (non-substantive) changes. These changes are needed to improve clarity and readability.

Subsection D.3.4.2, "Capacitors". This section was amended to replace the acronyms with written-out words and other editorial (non-substantive) changes. These changes are needed to improve clarity and readability.

Subsection D.3.4.3, "Electromechanical Flywheels". This section was amended to replace the acronyms with written-out words and other editorial (non-substantive) changes. These changes are needed to improve clarity and readability.

Subsection D.3.5, This title of this section was amended to replace the acronyms with written-out words. This change is needed to improve readability.

Subsection D.3.5.1, "Total Fuel Energy". This section was amended to add hydraulic and flywheel to the list of other hybrid vehicles in addition to one other editorial change. These changes are needed to be more inclusive of the types of hybrid vehicles that could use the specified procedures for determining total fuel energy and to improve readability.

Subsection D.3.4.2, "Total Cycle Energy". This section was deleted since it is no longer needed.

Subsection D.3.5.2, "Determination Procedure". This section was amended to change the acceptable net energy change variance to 1% from 2% and to provide for a correction procedure to follow if the net energy change is greater than 1% but less than 5%. These changes are needed to be consistent with SAE J2711 specifications. Other editorial changes in this section are needed to improve readability.

Subsection D.5. This section was amended to replace "urban transit buses" with "vehicles". This change is needed to expand the types of heavy-duty hybrid vehicles that could certify using these test procedures.

Amendments to Section E

"Certification by Emission Factor Ratio Application". This section was amended to state that when calculating an emission factor the larger of the two test results are to be used. This change is needed to clarify the existing method used by ARB certification staff to calculate the emission factors when reviewing test results provided by an applicant as required by the test procedures.

Subsection E.1, "Emission Factor". This section was amended to replace acronyms with written-out words and to replace "urban transit buses" with "vehicles". These changes are needed to improve readability and to expand the types of heavy-duty hybrid vehicles that could certify using these test procedures.

Subsection E.2, "Emission Factor Ratio". This section was amended to replace "urban transit buses" with "vehicles". These changes are needed to expand the types of heavy-duty hybrid vehicles that could certify using these test procedures.

Subsection E.3, "Application of Emission Factor Ratio for Hybrid-Electric Vehicle Certification". This section was amended to replace acronyms with written-out words and to replace "buses" with "vehicles". These changes are needed to improve readability and to expand the types of heavy-duty hybrid vehicles that could certify using these test procedures.

1. "Guidance Document and Recommendations on the Types of Scientific Information Submitted by Applicants for California Fuels Environmental Multimedia Evaluations (Revised June 2008)," University of California, Davis, University of California, Berkeley, and Lawrence Livermore National Laboratory, available at http://www.arb.ca.gov/fuels/multimedia/080608guidance.pdf section 2293.2(a)(20);

2. ASTM D613-10ae1, "Standard Test Method for Cetane Number of Diesel Fuel Oil (2010)," section 2293.7;

3. ASTM D5186-03(2009), "Standard Test Method for Determination of Aromatic Content and Polynuclear Aromatic Content of Diesel Fuels and Aviation Turbine Fuels by Supercritical Fluid Chromatography (2009)," section 2293.6;

4. ASTM D287-12b, "Standard Test Method for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method) (2012)," Appendix 1(a)(2), (a)(3)(C), (a)(3)(D), (a)(3)(E);

5. ASTM D4629-12, "Standard Test Method for Trace Nitrogen in Liquid Petroleum Hydrocarbons by Syringe/Inlet Oxidative Combustion and Chemiluminescence Detection (2012)," Appendix 1(a)(3)(C), (a)(3)(D), (a)(3)(E);

6. ASTM D5453-93, "Standard Test Method for Determination of Total Sulfur in Light Hydrocarbons, Spark Ignition Engine Fuel, Diesel Engine Fuel, and Engine Oil by Ultraviolet Fluorescence (1993)," section 2293.7(a)(1), Appendix 1(a)(3)(C), (a)(3)(D), (a)(3)(E);

7. ASTM D6890-13a, "Standard Test Method for Determination of Ignition Delay and Derived Cetane Number (DCN) of Diesel Fuel Oils by Combustion in a Constant Volume Chamber (2013)," section 2293.6(a), Appendix 1(a)(2);

8. ASTM D445-12, "Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity) (2012)," Appendix 1(a)(3)(C), (a)(3)(D), (a)(3)(E);

9. ASTM D93-13, "Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester (2013)," Appendix 1(a)(3)(C), (a)(3)(D), (a)(3)(E);

10. ASTM D86-12, "Standard Test Method for Distillation of Petroleum Products at Atmospheric Pressure (2012)," Appendix 1(a)(3)(C), (a)(3)(D), (a)(3)(E);

11. EN 14103:2011, "Fat and oil derivatives. Fatty acid methyl esters (FAME). Determination of ester and linolenic acid methyl ester contents (2011)," Appendix 1(a)(3)(C), (a)(3)(D);

12. Snedecor and Cochran, "Statistical Methods," (7th ed., 1980), p.91, Iowa State University Press, Appendix 1(a)(3)(G);

Background and Effect of the Proposed Rulemaking:

The Low Carbon Fuel Standard (LCFS) (title 17, California Code of Regulations (CCR) section 95480 et seq.) and the federal Renewable Fuels Standard (RFS) (section 211 of the Clean Air Act, 42 United States Code 7545) both incentivize the expansion of the California transportation fuel pool to include more renewable and low carbon replacements for conventional motor vehicle gasoline and diesel. Furthermore, title 13, California Code of Regulations sections 2281 through 2285, impose fuel quality standards on conventional motor vehicle diesel fuel to limit both sulfur and aromatic hydrocarbon content.

There are already alternative diesel fuel substitutes in the California market, such as biodiesel and renewable diesel, and the LCFS, RFS, and other policies and programs will encourage further innovations in fuels. Some of these innovative fuels are already sold commercially and controlled through industry consensus standards that are implemented by the California Department of Food and Agriculture. Such fuels-related industry consensus standards seek mainly to address vehicle performance and fuel production quality issues. By contrast, air quality impacts from alternative diesel fuels are generally addressed by ARB or the U.S. Environmental Protection Agency (EPA).

The current California diesel fuel regulations focus almost entirely on petroleum hydrocarbon-based fuels for compression ignition engines. Because of the focus on petroleum fuels, the existing diesel regulations are ill-suited to providing a market pathway for innovative non-hydrocarbon-based alternative diesel fuels (e.g., biodiesel, dimethyl ether) and for ensuring that the anticipated air quality benefits from ARB's existing specifications for California diesel ("CARB diesel") are preserved.

Therefore, staff is proposing to consolidate existing administrative and legal procedures and requirements for alternative diesel fuels into this new regulation. The regulation will establish clear legal requirements for the introduction and commercial use of both current ADFs not already subject to ARB fuel standards and also new ADFs developed in the future. Staff proposes to specify biodiesel as the first commercial alternative diesel fuel subject to this new regulation, which will include necessary provisions to ensure fuel quality, safeguard against potential increases in oxides of nitrogen (NOx) emissions, and maintain enforceability of these requirements.

Objectives and Benefits of the Proposed Regulation:

The primary objective of the proposed ADF regulation is to create a streamlined legal framework that protects California's residents and environment while allowing innovative ADFs to enter the commercial market as efficiently as possible. The proposal is intended to ensure that the introduction and use of innovative ADFs in California will have no significant adverse impacts on public health or the environment relative to conventional, petroleum-based "CARB diesel."

The proposed ADF regulation establishes a comprehensive, multi-stage process governing the commercialization of new ADFs in California. This process would start with a screening analysis that would allow limited sales of a regulated diesel substitute while it undergoes an initial evaluation; an intermediate stage with expanded sales governed by enhanced monitoring, testing, and a multimedia evaluation; and a final stage with full-scale commercial sales and provisions designed to maintain environmental and public health protections as needed. The main benefit to the State is to provide and maintain safeguards that protect public health and the environment while such new fuels are being tested and used. The proposed regulation also benefits the State by providing a framework and clear rules that, in turn, will encourage the more rapid introduction of new innovative fuels with demonstrated public health advantages. Many of the innovative fuels under development have lower emissions of greenhouse gases (GHG), criteria, and toxic air pollutants, and a number of such fuels can also be produced from renewable or waste sources.

The proposal represents the culmination of a major ARB effort to develop a clear pathway for the commercialization of new diesel fuel substitutes. Over the past several years, ARB staff has conducted and continues to conduct essential research and analyses to understand the air quality impacts of biodiesel, renewable diesel, and other diesel fuel substitutes and additives (e.g., dimethyl ether, diesel additives). ARB also sponsored a comprehensive multimedia assessment under Health and Safety Code section 43830.8 for biodiesel and renewable diesel to determine if these fuels have any significant adverse impacts relative to conventional CARB diesel.

The effort started with the need to characterize and quantify the emissions potential of biodiesel and renewable diesel, the ultimate goal being the establishment of air quality-based fuel specifications for these two diesel substitutes that would allow for full commercialization in California. However, since that effort began, the LCFS, RFS, and other fuels policies and programs came into effect. Those programs encourage fuel producers to innovate, not only with biodiesel and renewable diesel, but also with other lower carbon fuels such as dimethyl ether. Indeed, such fuels are already under development. Consequently, ARB staff determined that a uniform and comprehensive review and approval program is needed to set clear ground rules for introducing and commercializing diesel fuel substitutes, both current ones like biodiesel and renewable diesel and upcoming ones such as dimethyl ether and others, while preserving the benefits of CARB diesel.

ARB staff has worked with major stakeholders such as biodiesel and renewable diesel producers; petroleum refiners and marketers; engine manufacturers; and environmental and public health advocates and local air districts to solicit input via meetings and public workshops on this proposal. Staff developed the proposal based on ARB testing and research, and feedback from stakeholders.

DETERMINATION OF INCONSISTENCY AND INCOMPATIBILITY WITH EXISTING STATE REGULATIONS

During the process of developing the proposed regulatory action, ARB staff reviewed other programs related to ADFs and concluded that the proposal is consistent and compatible with existing state regulations. In particular, staff reviewed two existing California programs: the ARB's Low Carbon Fuel Standard and the California Department of Food and Agriculture's (CDFA) fuels program.

The Low Carbon Fuel Standard regulation (17 CCR 95480 et seq.) reduces the average carbon intensity (CI) of California transportation fuels. However, the LCFS neither sets fuel specifications or any other requirements on the properties of the regulated fuels, nor does it establish provisions that govern the use and commercialization of transportation fuels. Thus, the proposal would be consistent and compatible with the LCFS.

Staff also reviewed CDFA's fuels program. The staff's proposal is consistent and compatible with the CDFA's fuels program because the fuel specifications in the proposal are air quality-based. Air quality-based specifications are allowed under State law, and the specifications in the proposal for ADFs that are currently regulated by CDFA (i.e., currently biodiesel and renewable diesel) fall within those contained in CDFA's regulations. Further, the proposal similarly is consistent and compatible with CDFA's developmental fuels variance program. This is because CDFA's program is intended to generate engine performance and warranty data to inform development of a consensus standard, while the proposal's screening analysis and multimedia evaluation provisions are intended to characterize environmental and public health impacts.

COMPARABLE FEDERAL REGULATIONS

There are no federal regulations that are comparable to the proposed regulation or would accomplish the same objectives and benefits. The U.S. EPA implements a registration program for fuels and fuel additives under title 40, Code of Federal Regulations, part 79. Under that program, proponents of new fuels and fuel additives need to provide to U.S. EPA requested information so that the agency can determine the fuel or additive's "product emissions that may pose an unreasonable risk to public health." In addition, the U.S. EPA implements the Renewable Fuels Standard program (RFS2), which mandates fixed volumes of specified biofuels to be blended with the national gasoline and diesel fuel pools. Under this program, mandated annual volumes of biomass-based diesel are specified, including biodiesel and renewable diesel.

There are a number of significant differences between the federal programs and the staff's proposal. First, the federal registration program applies only to gasoline and diesel and their additives. By contrast, the staff's proposal applies to any new alternative diesel fuel, including fuels that bear little or no resemblance to conventional diesel but nevertheless are designed to be used in compression ignition engines. Another significant difference is that the federal program applies only to on-road fuels and additives, while the staff's proposal applies to alternative diesel fuels used in on-

road and off-road motor vehicles. For these reasons the federal program under 40 CFR 79 is neither comparable to the proposal nor would it accomplish the same objectives and benefits. Similarly, the proposal presents no conflict or inconsistency with the RFS2 program since the proposal does not restrict the volume sales of biodiesel, other biomass-based ADFs, or any other biofuels subject to RFS2. Instead, the proposal would impose specified pollutant mitigation measures (which does not include sales volume limits) if and when certain specified criteria are met, and staff's analysis projects it is highly unlikely those criteria will be met in the foreseeable future. Further, the proposal is based on California's general police power authority and is consistent with the provisions governing the State's regulation of fuels and fuel additives under section 211 of the Clean Air Act.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

ARB staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes a summary of the economic and environmental impacts of the proposal. The ISOR is entitled, "Staff Report: Initial Statement of Reasons for the Proposed Regulation on the Commercialization of New Alternative Diesel Fuels."

Copies of the ISOR and the full text of the proposed regulatory language may be accessed on ARB's website listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990, on October 23, 2013.

Final Statement of Reasons Availability

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

Agency Contact Persons

Inquiries concerning the substance of the proposed action may be directed to the designated agency contact persons, Jim Aguila, Manager of the Substance Evaluation Section, at (916) 322-8283, or Alexander Mitchell, Air Pollution Specialist, at (916) 327-1513.

Further, the agency representative to whom nonsubstantive inquiries concerning the proposed administrative action may be directed is Amy Whiting, Regulations Coordinator, (916) 322-6533. The Board staff has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

Internet Access

This notice, the ISOR and all subsequent regulatory documents, including the FSOR, when completed, are available on ARB's website for this rulemaking at http://www.arb.ca.gov/regact/2013/adf2013/adf2013.htm.

DISCLOSURES REGARDING THE PROPOSED REGULATION

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 regulatory action are presented below.

Fiscal Impact / Local Mandate

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

Significant Statewide Adverse Economic Impact Directly Affecting Business, Including Ability to Compete

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

Cost Impacts on Representative Private Persons or Businesses

In developing this regulatory proposal, the Executive Officer evaluated the potential economic impacts on representative private persons or businesses. As explained in the ISOR, the ARB is not aware of any significant cost impacts that a representative private person or business would necessarily incur in reasonable compliance with the proposed action.

Results of the Economic Impact Analysis/Assessment Prepared Pursuant to Government Code Sec. 11346.3(b)

Effect on Jobs/Businesses:

The Executive Officer has determined that the proposed regulatory action would not affect the creation or elimination of jobs within the State of California, the creation of new businesses or elimination of existing businesses within the State of California, or the expansion of businesses currently doing business within the State of California. A

detailed assessment of the economic impacts of the proposed regulatory action can be found in the Economic Impact Analysis in the ISOR.

Benefits of the Proposed Regulation:

The economic benefits of the proposed ADF regulation include the certainty provided by establishing clear rules and procedures for commercializing new alternative diesel fuels in California, which in turn reduces the cost and time required to bring new ADFs to market. At the same time, the proposal preserves the emission benefits of existing conventional "CARB diesel" fuel. Further, the proposed regulation benefits the State by encouraging a more rapid deployment of ADFs that could demonstrate significant public health advantages, such as lower criteria and toxic emissions, lower greenhouse gas emissions, and preservation of ecological resources, since many ADFs are produced from renewable or waste product sources.

The proposed regulation requires mitigation prior to biodiesel sales reaching a threshold that would cause an overall NOx emissions increase. Such mitigation would result in additional costs. However, staff's anlaysis indicates it is highly unlikely that the threshold would be reached and therefore no mitigation costs are assumed.

The proposed ADF regulation does not require any specific amount of biodiesel or renewable diesel production volume. Instead, it will establish fuel standards and a legal framework for biodiesel and other ADFs to enter the commercial market. Producers of biodiesel can already meet the proposed standards, and biodiesel itself will enter into the proposed ADF program at the monitored commercialization stage called Stage 3A. Because producers of biodiesel will be in the same position in the market as they were before promulgation of the proposed regulation, no jobs will be created or lost due to the staff's proposal. Some increased testing and recordkeeping will be required under the proposal; however, no jobs will be created or lost since current businesses can accommodate the increased testing and recordkeeping with existing resources.

A summary of these benefits is provided. Please refer to "Objectives and Benefits," under the Informative Digest of Proposed Action and Policy Statement Overview Pursuant to Government Code 11346.5(a)(3) discussion earlier in this notice.

Effect on Small Business

The Executive Officer has also determined, pursuant to California Code of Regulations, title 1, section 4, that the proposed regulatory action would not have any significant impacts on small businesses because any costs of compliance are minimal and will not affect the retail price of ADFs offered to the public.

Housing Costs

The Executive Officer has also made the initial determination that the proposed regulatory action will not have a significant effect on housing costs.

Business Reports

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

Alternatives

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the Board, or that has otherwise been identified and brought to the attention of the Board, would be more effective in carrying out the purpose for which the action is proposed, or would be as effective and less burdensome to affected private persons than the proposed action, or would be more cost-effective to affected private persons and equally effective in implementing the statutory policy or other provisions of law. The analysis of such alternatives can be found in Chapter 7 of the ISOR.

Environmental Analysis

In accordance with ARB's certified regulatory program, California Code of Regulations, title 17, sections 60006 through 60007, and the California Environmental Quality Act, Public Resources Code section 21080.5, ARB staff has conducted an analysis of the potential for significant adverse and beneficial environmental impacts associated with the proposed regulatory action. The environmental analysis of the proposed regulatory action can be found in Chapter 7 of the ISOR.

WRITTEN COMMENT PERIOD AND SUBMITTAL OF COMMENTS

Interested members of the public may present comments orally or in writing at the meeting and may provide comments by postal mail or by electronic submittal before the meeting. The public comment period for this regulatory action will begin on October 28, 2013. To be considered by the Board, written comments not physically submitted at the meeting, must be submitted on or after October 28, 2013 and received **no later than 12:00 noon on December 11, 2013**, and must be addressed to the following:

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

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

You can sign up online in advance to speak at the Board meeting when you submit an electronic board item comment. For more information go to: http://www.arb.ca.gov/board/online-signup.htm.

Please note that under the California Public Records Act (Gov. Code, § 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request.

ARB requests that written and email statements on this item be filed at least 10 days prior to the hearing so that ARB staff and Board members have additional time to consider each comment. The Board encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

Additionally, the Board requests but does not require that persons who submit written comments to the Board reference the title of the proposal in their comments to facilitate review.

AUTHORITY AND REFERENCE

This regulatory action is proposed under the authority granted in Health and Safety Code, sections 38510, 38560, 38560.5, 38571, 38580, 39600, 39601, 41510, 41511, 43013, and 43018; and *Western Oil and Gas Ass'n v. Orange County Air Pollution Control District*, 14 Cal. 3rd 411, 121 Cal.Rptr. 249 (1975). This action is proposed to implement, interpret, and make specific sections 38501, 38510, 38560, 38560.5, 38571, 38580, 39000, 39001, 39002, 39003, 39515, 39516, 41510, 41511, 43013, and 43018, Health and Safety Code; and *Western Oil and Gas Ass'n v. Orange County Air Pollution Control District*, 14 Cal. 3rd 411, 121 Cal.Rptr. 249 (1975).

HEARING PROCEDURES

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

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

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

SPECIAL ACCOMMODATION REQUEST

Consistent with California Government Code Section 7296.2, special accommodation or language needs may be provided for any of the following:

- An interpreter to be available at the hearing;
- Documents made available in an alternate format or another language;
- A disability-related reasonable accommodation.

To request these special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by facsimile at 916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled Board hearing. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

Consecuente con la sección 7296.2 del Código de Gobierno de California, una acomodación especial o necesidades linguisticas pueden ser suministradas para cualquiera de los siguientes:

- Un intérprete que esté disponible en la audiencia
- Documentos disponibles en un formato alterno u otro idioma
- Una acomodación razonable relacionados con una incapacidad

Para solicitar estas comodidades especiales o necesidades de otro idioma, por favor llame a la oficina del Consejo al (916) 322-5594 o envíe un fax a (916) 322-3928 lo más pronto posible, pero no menos de 10 días de trabajo antes del día programado para la audiencia del Consejo. TTY/TDD/Personas que necesiten este servicio pueden marcar el 711 para el Servicio de Retransmisión de Mensajes de California.

CALIFORNIA AIR RESOURCES BOARD

Richard W. Corey
Executive Officer

Date: October 15, 2013

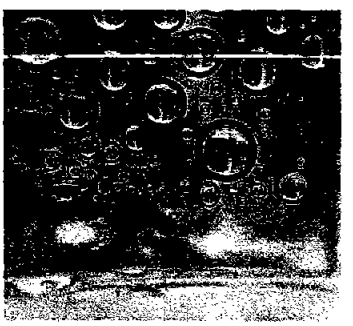
The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website at www.arb.ca.gov.

California Environmental Protection Agency

Air Resources Board

Proposed Regulation on the Commercialization of New Alternative Diesel Fuels

Staff Report: Initial Statement of Reasons






Stationary Source Division
Alternative Fuels Branch

Release Date: October 23, 2013

To Be Considered by the Board: December 12-13, 2013

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State of California
Air Resources Board

Staff Report: Initial Statement of Reasons for Proposed Rulemaking

Proposed Regulation on the Commercialization of New Alternative Diesel Fuels

Date of Release: October 23, 2013
Scheduled for Consideration: December 12-13, 2013

Location:

California Air Resources Board
Byron Sher Auditorium
1001 I Street
Sacramento, California 95814

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 of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

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Initial Statement of Reasons

Public Hearing to Consider the Proposed Regulation on the Commercialization of New Alternative Diesel Fuels

Air Resources Board Meeting
December 12-13, 2013, at 9:00 a.m.
California Environmental Protection Agency
Air Resources Board
Byron Sher Auditorium
1001 I Street
Sacramento, California 95814

For those unable to attend the meeting in person, live video webcast will be available beginning at 9:00 a.m. on December 12-13, 2013, at http://www.calepa.ca.gov/broadcast.

This staff report and related materials are available for download from the Air Resources Board's internet site at http://www.arb.ca.gov/regact/2013/adf2013/adf2013.htm.

In addition written copies may be obtained from the Board's Public Information Office, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990.

If you have a disability-related accommodation need, please go to: http://www.arb.ca.gov/html/ada/ada.htm for assistance or contact the Reasonable Accommodation Coordinator at (916) 323-4916. If you are a person who needs assistance in a language other than English, please contact the Bilingual Coordinator at (916) 324-5049.

Questions

Inquiries concerning the substance of the proposed amendments to the regulations may be directed to the designated agency contact persons:

Mr. Jim Aguila
Manager
Substance Evaluation Section
(916) 322-8283
Email: jaguila@arb.ca.gov

or

Mr. Alexander Mitchell
Air Pollution Specialist
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Prepared by Staff of the:

Substance Evaluation Section
Alternative Fuels Branch
Stationary Source Division

Reviewed by:

Stationary Source Division

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Glossary

List of Acronyms and Abbreviations

AAQS	Ambient Air Quality Standards
ADF	Alternative Diesel Fuels
ARB or Board	California Air Resources Board
CAA or the Act	Clean Air Act
CDFA	California Department of Food and Agriculture
CEPC or Council	California Environmental Policy Council
CEQA	California Environmental Quality Act
CO	Carbon Monoxide
CCR	California Code of Regulations
DME	Dimethyl Ether
DMS	Division of Measurement Standards, (Division within CDFA)
EISA	Energy Independence and Security Act of 2007
EO	Executive Officer
FAME	Fatty Acid Methyl Esters
GHG	Greenhouse Gas
HC	Hydrocarbons
H&SC	California Health and Safety Code
LCFS	California Low Carbon Fuel Standard
MMT	Million Metric Tons
MMWG	Multimedia Working Group
MOU	Memorandum of Understanding
NOx	Oxides of Nitrogen
NREL	National Renewable Energy Lab
NTDE	New Technology Diesel Engines
OSFM	Office of the State Fire Marshal
PAHs	Polycyclic Aromatic Hydrocarbons
PM	Particulate Matter
ppmw	Parts per Million by Weight
RFS	Renewable Fuels Standard
SCR	Selective Catalytic Reduction
SWRCB	California State Water Resources Control Board
SVO	Straight Vegetable Oil
U.S. EPA	U.S. Environmental Protection Agency
UST	Underground Storage Tanks
WVO	Waste Vegetable Oil

EXECUTIVE SUMMARY

The staff of the Air Resources Board (ARB or Board) is proposing a new regulation to govern the commercialization of motor vehicle alternative diesel fuels (ADF) in California. The ADF regulation is intended to provide a legal pathway for new, emerging diesel fuel substitutes to enter the commercial market in California, while managing and minimizing environmental and public health impacts, and to preserve the emissions benefits derived from the ARB motor vehicle diesel regulations. New ADFs are those alternative diesel fuels that do not have an established ARB fuel specification in effect prior to January 1, 2015. The proposed regulation consists of two major parts: a three stage phase-in of ADF fuels into California commerce, and mitigation measures set in place and applied as needed to ensure no degradation in air quality. Although this will be a new regulation, the proposal consolidates many current administrative and regulatory practices into one regulation that provides a clear pathway to commercialization of ADFs.

ARB has not previously regulated ADFs under a comprehensive and structured program except in very limited cases. It has become necessary to establish a formal legal framework for regulating such fuels for two primary reasons. First, programs such as the State's Low Carbon Fuel Standard (LCFS) and the federal Renewable Fuels Standard (RFS) are expected to incentivize the rapid development of new ADFs. Many of these fuels provide criteria and toxic emission reductions in addition to their greenhouse gas (GHG) benefit. Second, testing by ARB and others shows that some ADFs can have adverse effects on emissions under certain circumstances. For these and other reasons, we are proposing the regulation to ensure that new ADFs are commercialized in California under specific requirements and conditions that maintain public health protections and ensure no degradation in air quality.

The first ADF that will be regulated under this action is biodiesel. We based the proposed regulation in large part on our experience with analyzing biodiesel and renewable diesel over the past several years. Fuel specifications and other requirements for future ADFs will be incorporated into this regulation through additional rulemakings.

What are we proposing?

The proposed regulation would require an ADF to undergo a three-stage process that evaluates the ADF for environmental impacts prior to its widespread use in California. As part of that evaluation process, the regulation puts into place measures that would apply when needed to maintain current air quality protections. Many of the provisions in this regulation are already required under existing State law. The three stages of this process are described below.

Stage 1: Pilot Program. In this stage, an ADF proponent(s) would apply to ARB for a pilot program under which no more than 1 million gallons total of the ADF could be used in the State in well-defined fleets within a year. During that time, the applicant would

conduct required testing and emissions evaluations. The application process includes disclosure of the chemical composition of the ADF, as well as other important information, which would enable staff to conduct a screening analysis. This screening analysis is intended to help ARB staff determine whether use of the ADF presents a potential adverse impact to the public health or environment. Advancement to Stage 2 requires the ADF proponent to fulfill the Stage 1 requirements and enter into an agreement with the Executive Officer (EO) to complete and satisfy specified terms and conditions, such as additional emissions testing, which will apply during the second stage.

Stage 2: Fuel Specification Development. In this stage, an ADF proponent(s) would apply for a broader, but still limited, agreement allowing use of up to 30 million gallons of that ADF per year in a larger fleet. The larger volume and sample fleet would allow more comprehensive testing and analyses that would inform a multimedia evaluation; help develop consensus standards for the ADF; identify what circumstances, if any, could result in a significant adverse impact on public health or the environment; and determine what, if any, potential mitigating options can be implemented for the ADF under those circumstances.

During this stage, ARB staff would determine whether a significance threshold for a pollutant of concern exists for the fuel. For example, based on our comprehensive testing program to date, ARB staff determined that biodiesel has a significance threshold for oxides of nitrogen (NOx) of 10 percent biodiesel by volume. In other words, once the biodiesel blend level in the State or in an air basin reaches 10 percent or more by volume, staff would expect a statistically significant increase in NOx emissions in the absence of any mitigating factors.

Stage 3: Commercial Sales. This stage is split into Stage 3A and Stage 3B. Stage 3A is applicable to ADFs for which ARB staff has identified a significance threshold. An ADF sold in California under this stage would be subject to potential sales conditions and mitigation measures that are based on the significance threshold(s) determined in Stage 2. By contrast, Stage 3B is applicable to ADFs for which no significance threshold has been identified. Accordingly, ADFs in Stage 3B can be used at any blend and without any potential conditions or mitigation measures.

An ADF subject to Stage 3A is subject to enhanced monitoring and recordkeeping. The ARB staff would use such monitoring and records, along with other market and fleet data, to calculate an "effective blend level" annually or more frequently, as specified in the regulation. The effective blend level is the statewide average blend of an ADF that accounts for and benefits from the effects of mitigating factors identified by the staff. This concept is illustrated as follows.

As noted, ARB testing showed that biodiesel blends, derived from soy, at or higher than B10 (10% biodiesel and 90% CARB diesel, by volume) tend to yield statistically significant increases in NOx (relative to conventional CARB diesel) when those blends are used in older heavy-duty vehicles. A simplistic prohibition theoretically could be

based on this fact alone. However, prohibiting B10 and higher biodiesel blends, while conceptually simple to implement, would ignore a number of real and significant factors that affect the overall NOx impact. A more nuanced, sophisticated and market-reflective regulatory approach would incorporate those factors. For example, the same ARB testing and research program that showed potential NOx increases with higher biodiesel blends also showed that the NOx can be tempered and negated by a number of factors, such as:

- biodiesel used in blends at B9 or below, including the B5 (B0 to B5) in predominant use today, does not increase NOx;
- use of renewable diesel actually decreases NOx, with higher renewable diesel blend levels yielding greater NOx reductions;
- similarly, use of low-NOx diesel (a subset of CARB diesel that has a high natural cetane number and other distinctive properties) also reduces NOx, with higher blends of low-NOx diesel yielding greater NOx reductions;
- use of certain diesel additives at specified dosage rates can also reduce NOx;
- use of biodiesel derived from animal feedstocks results in a substantially lower NOx impact than biodiesel derived from soy;
- use of biodiesel in 2010-compliant engines and other so-called "New Technology Diesel Engines" does not increase NOx, regardless of the biodiesel blend level; and
- use of biodiesel in light and medium duty vehicles does not increase NOx.

Thus, a more sophisticated regulatory approach would account for these effects and consolidate them into a single calculation. The proposed regulation employs this approach in what is called the effective blend level. There is a specific calculation for biodiesel's effective blend level that takes the above factors into account, and there would be similar but different equations unique to other ADFs that account for the mitigating factors specific to each ADF.

For biodiesel, the effective blend level calculation shows that the NOx effects from the use of biodiesel are tempered and negated by the cumulative effects of the above mitigating factors. Thus, based on our projections and analysis of these mitigating factors that are already occurring in the California market, it is highly unlikely that the volumes of biodiesel at the State and regional levels can reach a blend level that compromises existing air quality protections. In the unlikely event that biodiesel volumes increase beyond the ability of ongoing market factors to fully offset the NOx effects, the proposal establishes specific mitigation measures that would go into effect prior to reaching such high biodiesel volumes. This would ensure that current air quality protections are maintained even in those circumstances.

The effective blend level calculation reflects the results of ARB's testing program and research and sends a much stronger market signal that incentivizes increased use of those mitigating factors, rather than merely banning all higher biodiesel blends. The proposal provides that if the calculated effective blend level, statewide or regionally, reaches 95 percent of the significance threshold for a pollutant of concern, the

mitigation requirements would be triggered. Thus, by implementing the mitigation measures at 95 percent of the significance threshold, we can ensure that the use of an ADF would not result in increased air pollution, degradation of air quality, or reduced protection for the environment or public health.

As noted, an ADF that is subject to Stage 3B has been determined to have no significance threshold. Thus, such an ADF would be subject only to periodic reporting and recordkeeping provisions, but it can be sold in full commercialized volumes without any mitigation-related requirements.

Why are we taking this action?

Consumption of ADFs, such as biodiesel, is expected to increase in the coming years due to a variety of policy incentives including the RFS, LCFS, and federal blending tax credits. As such, it is important to ensure that the full commercialization of these fuels does not increase air pollution or cause other environmental concerns. The proposed regulation will ensure this by subjecting new ADFs to a rigorous environmental review conducted in specified phases with definite terms and conditions. As part of the environmental review, the ARB staff will determine whether the ADF has a significance threshold for a pollutant of concern. In that case, the staff will identify the circumstances under which the significance threshold may be reached and the specific mitigation measures that will be applied when conditions are such that the effective blend level has reached 95 percent of the identified significance threshold.

As noted, it has been determined that higher blends of biodiesel, the first ADF to be subject to the proposed regulation, can increase NOx under certain circumstances and in the absence of mitigating factors. However, ARB staff has also determined that NOx associated with these higher blends are mitigated by a number of factors. Accordingly, ARB staff has designed the proposed regulation to ensure that biodiesel can be commercialized at any blend level without an increase in NOx. The regulation provides for a proper accounting of mitigating factors already occurring in the California market and the application of mitigation measures in the unlikely event the effective blend level for biodiesel reaches 95 percent of the significance threshold.

In general, the ADF regulation will provide a clear pathway for emerging ADFs and drive the development of clean, low carbon fuels to improve California's energy security and energy independence.

Who is affected by this regulation?

The regulation applies primarily to producers and importers of an alternative diesel fuel. A proponent of a new ADF would typically be an entity seeking to produce or import the ADF into California, and that entity would typically be the one that applies for entry into the various stages set forth in the regulation. To the extent needed, the applicant producer or importer generally would be responsible for applying any mitigation measures that are triggered when the effective ADF blend level is approached. Retail

marketers and distributors of alternative diesel fuels are generally not affected by the mitigation measures unless they are also conducting fuel blending. Retailers may be required to do some of the required recordkeeping and monitoring, but these generally would apply to the higher blends of an ADF (e.g., for marketers of B10 or higher blends).

What are the costs of this regulation?

Staff expects the costs directly attributable to this regulation to be minimal. Regulatory costs are primarily some increases in reporting and testing of ADFs. Many of the requirements of this regulation already exist under other State law, and as such cannot be considered an additional cost of this regulation. For example, much of the reporting associated with this regulation is required to comply with the LCFS regulation or other State or federal programs. The requirement for a multimedia evaluation of new ADFs is already required by ARB pursuant to Health and Safety Code (H&SC) section 43830.8, and development of consensus standards is already required by existing regulations implemented by the California Department of Food and Agriculture. The difference between existing law and this regulation is primarily the enhanced monitoring required, and a more streamlined route to the commercial market. Staff also estimated potential costs of mitigation. However, staff's analysis shows that mitigation being needed is highly unlikely and therefore these costs are not assumed to occur.

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CHAPTER 1. INTRODUCTION

A. Air Quality

Due to its unique geography, California has unique air pollution challenges. Ambient air quality standards designed to protect public health have been established for several pollutants in the State. Although California has made substantial progress, in many parts of the State, air pollution exceeds these ambient air quality standards for some pollutants. To attain the ambient air quality standards, the California Air Resources Board (ARB or Board) has designed a multi-faceted strategy, including emission reductions from mobile sources. The ARB uses its legal authority to regulate emissions from motor vehicle fuels in the State when appropriate to reduce air pollution. To date, ARB has developed fuel quality standards for gasoline, diesel and several alternative fuels.

Because of anticipated new motor vehicle fuels in California, ARB staff recognizes the need for a new regulation to preclude future commercial substitute diesel fuels from increasing air pollution.

B. Alternative Motor Vehicle Fuels

There is a trend in California toward increasing consumption of alternative motor vehicle fuels in place of conventional petroleum-based gasoline and diesel fuels. This trend is primarily due to economic incentives and policies at the State and national level that incent the use of lower polluting, less toxic, and lower carbon intensity fuels in the commercial market. A more detailed discussion of these new fuels is presented in Chapters 2 through 4. As a result of this diversification, some diesel fuel substitutes have started to enter commerce in California without clear regulatory requirements to ensure there are no detrimental impacts to air pollution as a result of their use. In response to this, ARB staff is proposing a new Alternative Diesel Fuel (ADF) regulation that will put the proper regulatory structure into place that will ensure no detrimental impacts to air quality as California moves toward increased alternative motor vehicle fuels consumption.

C. Alternative Diesel Fuels Overview

In general, alternative diesel fuels are a category of motor vehicle fuels that are not conventional diesel and do not solely consist of hydrocarbons. While there are a few alternative diesel fuels in existence today, biodiesel is by far the most notable. While renewable diesel is also an innovative diesel fuel replacement, it consists solely of hydrocarbons and is virtually indistinguishable from conventional diesel; therefore, renewable diesel is not considered an alternative diesel fuel under this proposed regulation.

1. Biodiesel:

Biodiesel has already been in use in California for several decades. There are misperceptions about biodiesel and some relate biodiesel to grease from fast food restaurants that is directly used in a diesel engine. Grease is referred to as straight vegetable oil (SVO), which has a long history of use in diesel engines. Peanut oil, a type of SVO, was the fuel that powered Rudolph Diesel's original compression ignition engine at the 1911 World Fair.

Other feed stocks such as animal tallow and waste vegetable oil contain high concentrations of triglycerides, which is the main component of fats and oils. These feed stocks can also be processed into biodiesel and depending upon the specific feed stock, there may be a range of emissions effects. For example, soybean oils tend to produce higher emitting biodiesel than animal tallow.

Although SVO can be used in most diesel engines, its use leads to durability issues, such as clogging of fuel injectors and fatty engine deposits. To create a fuel that is more appropriate for the modern diesel engine, SVO must be chemically converted to a form that has improved combustion properties through a process called transesterifcation. In order to accomplish this conversion, the SVO, or other feed stock, is chemically converted to fatty acid methyl esters (FAME) by reacting the SVO with methanol and a catalyst. The resulting FAME biodiesel is much cleaner burning and less viscous, reducing or eliminating many of the problems caused by SVO.

2. Renewable Diesel

In addition to biodiesel, ARB considered renewable diesel during this rulemaking. Renewable diesel uses essentially the same feed stocks that are used to make biodiesel, but instead of the transesterification reaction, renewable diesel is produced by hydroprocessing, which results in a fuel containing pure hydrocarbons, paraffinic compounds and nearly no aromatics. Renewable diesel has few of the disadvantages normally associated with biodiesel such as poor cold weather performance, biological degradation or oxidation stability. Alternatively, renewable diesel exhibits poor lubricity and generally must be used in a lubricated mixture or have a lubricity additive incorporated in the fuel. Additionally, renewable diesel is generally more homogeneous and does not exhibit the chemical variability of biodiesel made from different production feedstocks.

Biodiesel and renewable diesel are both low carbon fuels that can be produced domestically and in some cases may reduce air pollution. Biodiesel and renewable diesel produced from conventional feed stocks also reduce greenhouse gasses (GHG), with carbon intensities about 25 percent lower than petroleum diesel fuel. Using waste feedstocks, the carbon intensity can be as much as 80 percent lower than petroleum diesel fuel.

In some cases, biodiesel and renewable diesel may decrease emissions of harmful air pollutants. For example, many blends of biodiesel have been shown to decrease the emission rates of particulate matter, hydrocarbons and carbon monoxide. Additionally renewable diesel has been shown to reduce NOx, particulate matter, hydrocarbons and carbon monoxide.

D. Development Process for the Proposed Regulation

Staff evaluation of ADFs and biodiesel began in earnest in the early 2000s. During the informal rulemaking process, ARB staff conducted numerous meetings of the Multimedia Working Group (MMWG), multiple public workshops, and numerous meetings with individual stakeholders to discuss the proposed regulation. Below is a timeline of the public actions taken leading up to this proposal, each of the meetings below included opportunities for public comment, which were considered when developing the proposed regulation.

Table 1.1: ADF Regulatory Development Timeline

Date	Meeting
2004-2005	Two Biodiesel Work Group Meetings
2006-2007	Five Meetings of the Biodiesel Work Group
2008-2009	Six Meetings of the Biodiesel Work Group
2010	Two Rulemaking Development Workshops for Biodiesel Regulation
December 8, 2010	Multimedia Evaluation Meeting
October 4, 2011	Released Biodiesel Guidance Document
February 15, 2013	ADF Concept Paper
April 23, 2013	First ADF Rulemaking Workshop
June 13, 2013	Second ADF Rulemaking Workshop
September 5, 2013	Third ADF Rulemaking Workshop

For each of the rulemaking meetings above, over 7,000 individuals or companies were notified and invited to participate. Each of these meetings was well attended, and included a variety of stakeholders including refiners, oil marketers, alternative fuel producers, non-governmental organizations, academia, and other State agencies. Notices for the workshops, and associated materials, were posted to ARB's biodiesel and renewable diesel webpage at: http://www.arb.ca.gov/fuels/diesel/altdiesel/biodiesel.htm, and emailed to subscribers of our "altdiesel" listserve. Rulemaking workshops were made available to remote attendees by either webcast or webinar in all cases.

In addition to the public meetings, staff had many meetings with stakeholders, attended several trade meetings, and exchanged technical information on a regular basis with staff from other State agencies, academia, industry groups, and non-governmental organizations. As a result of this extensive communication with the affected entities, the proposal contained herein is based upon feedback from nearly every corner of the

regulated industry as well as other impacted organizations and individuals that are affected by actions concerning or regulate the fuels industry.

E. Organization of this Report

This report is organized into twelve chapters with three appendices. We start with four chapters of background and introduction followed by chapters for description of the proposed regulation, the technology assessment, environmental assessment, multimedia assessment, environmental justice, economic impacts analysis of this proposed regulation and concluding with a summary and rationale for the regulation as well as a references chapter.

CHAPTER 2. CALIFORNIA MANDATES ON AIR QUALITY

A. Ambient Air Quality Standards

Ambient air quality standards (AAQS) define clean air, and are established to protect even the most sensitive individuals in our communities. An air quality standard defines the maximum amount of a pollutant that can be present in outdoor air without harm to the public's health. Both the ARB and the U.S. Environmental Protection Agency (U.S. EPA) are authorized to set ambient air quality standards.

Air pollution harms the health of California residents, damages agricultural crops, forests and other plants, and creates the haze that reduces visibility. A large body of scientific evidence associates air pollution exposure with a variety of harmful health effects. To address air pollution, both the California ARB and the U.S. EPA have adopted ambient (outdoor) air quality standards. These legal limits on outdoor air pollution are designed to protect the health and welfare of Californians.

B. Greenhouse Gases and Climate Change

California's major initiatives for reducing climate change, or GHG emissions, are outlined in the California Global Warming Solutions Act of 2006 (AB 32), codified in H&SC section 38500 through 38599, and Executive Orders S-3-05 and B-16-2012. These efforts aim at reducing GHG emissions to 1990 levels by 2020 - a reduction of approximately 30 percent, and then an 80 percent reduction below 1990 levels by 2050.

AB 32 directed the Board to begin developing discrete early actions to reduce GHG emissions in California to 1990 levels by 2020. Among other provisions, AB 32 required the Board to identify and adopt discrete early actions in 2007 and to approve a Scoping Plan in 2008. Some specific requirements include the following responsibilities of ARB:

- Prepare and approve a scoping plan for achieving the maximum technologically feasible and cost-effective reductions in GHG emissions from sources or categories of sources of GHG by 2020 (H&SC §38561); and
- Identify the statewide level of GHG emissions in 1990 to serve as the emissions limit to be achieved by 2020 (H&SC §38550); and
- Adopt a regulation requiring the mandatory reporting of GHG emissions (H&SC §38530); and
- Identify and adopt regulations for discrete early actions that could be enforceable on or before January 1, 2010 (H&SC §38560.5). LCFS is one of the discrete early actions identified and adopted by ARB

1. Scoping Plan

In 2006, AB 32 required the ARB to develop a Scoping Plan that describes the approach California will take to reduce GHGs to achieve the goal of reducing emissions to 1990 levels by 2020. The Scoping Plan was approved by the Board and must be

updated at least every five years to evaluate the mix of AB 32 policies to ensure that California is on track to achieve the 2020 GHG reduction goal. The initial scoping plan relied upon implementation of the LCFS to achieve the 2020 goal.

In early 2013, ARB initiated activities to update the AB 32 Scoping Plan. A series of workshops were held in summer 2013. In December 2013, ARB expects to bring an updated Scoping Plan document to the Board for consideration.

The AB 32 Scoping Plan update will define ARB's climate change priorities for the next five years and lay the groundwork to reach post-2020 goals set forth in Executive Orders S-3-05 and B-16-2012. The update will highlight California's progress toward meeting the "near-term" 2020 GHG emission reduction goals defined in the original Scoping Plan (2008). It will also evaluate how to align the State's longer-term GHG reduction strategies with other State policy priorities, such as for water, waste, natural resources, clean energy and transportation, and land use.

CHAPTER 3. CALIFORNIA POLICIES AFFECTING MOTOR VEHICLE DIESEL FUEL

This chapter provides a summary of various State policies that affect motor vehicle diesel fuel and specifically the development of the ADF regulation. These policies broadly include statutes, regulations, or initiatives that impact the development of the ADF regulation.

A. California Health and Safety Code

California Senate and Assembly bills pertinent to motor vehicle diesel fuels are codified in the California Health and Safety Code (H&SC). These statutes are then administered as rules and regulations in the California Code of Regulations (CCR). The relevant statutes and regulations are provided below but are primarily contained in *H&SC Division 26, Parts 1, 2, and 5;* and *CCR Division 3, Titles 13 and 17.*

1. Development of Diesel Fuel Regulations

H&SC Sections 39600, 39601, 43013, 43018, 43101, and 43833 authorize the Board to adopt motor vehicle diesel fuel regulations. Section 43013 is the primary source of ARB's legal authority to adopt and implement motor vehicle fuel specifications, motor vehicle emission standards, and in-use performance standards for the control of air contaminants and sources of air pollution which the Board has found to be necessary, cost effective, and technologically feasible.

Section 43018 expands ARB's authority to adopt whatever control measures pertaining to fuels that are technologically feasible, cost-effective, and necessary to attain the state AAQS by the earliest practicable date.

2. Fuels Multimedia Evaluation

H&SC section 43830.8 requires the state Board to conduct a multimedia evaluation before adopting any regulation that establishes motor vehicle fuel specifications. Section 43830.8(b) defines "multimedia evaluation" as "the identification and evaluation of any significant adverse impact on public health or the environment, including air, water, or soil, that may result from the production, use, or disposal of the motor vehicle fuel that may be used to meet the state board's motor vehicle fuel specification."

Section 43830.8 also requires the California Environmental Policy Council (CEPC or Council) to review the multimedia evaluation and determine if any significant adverse impact on public health or the environment may result from a proposed regulation. If the Council determines that the proposed regulation will cause a significant adverse impact on public health or the environment, or that alternatives exist that would be less adverse, the Council shall recommend alternative or mitigating measures to reduce the adverse impact on public health and the environment.

B. Low Carbon Fuel Standard

In January 2007, Executive Order S-01-07 called for a low carbon fuel standard for transportation fuels to be established for California. The Executive Order specifies a reduction of at least 10 percent in the average carbon intensity of California's transportation fuels by 2020.

The Executive Order instructs the California Environmental Protection Agency to coordinate activities between the University of California (UC), the California Energy Commission (CEC), and other state agencies to develop and propose a draft compliance schedule to meet the 2020 target. Furthermore, it directed ARB to consider initiating regulatory proceedings to establish and implement the LCFS. The ARB identified the LCFS as an early action measure and approved it on April 23, 2009. The LCFS regulation will reduce GHG emissions in California by reducing the carbon intensity of transportation fuels used in the State by an average of 10 percent by the year 2020.

California's LCFS will reduce GHG emissions from the transportation sector in California by about 16 million metric tons (MMT) in 2020. These reductions account for almost 20 percent of the total GHG emission reductions needed to achieve the State's mandate of reducing GHG emissions to 1990 levels by 2020. In addition, the LCFS is designed to reduce California's dependence on petroleum, create a lasting market for clean transportation technology, and stimulate the production and use of alternative, low-carbon fuels in California.

The LCFS is designed to provide a framework that uses market mechanisms, based carbon intensity – a full lifecycle accounting of a fuels carbon emissions relative to its energy potential, to spur the steady introduction of lower carbon fuels. The framework establishes performance standards that fuel producers and importers must meet each year beginning in 2011. Since the regulation went into effect, regulated parties have operated under the LCFS program with no significant compliance issues.

In general, the LCFS is working as designed and intended. Fuel producers are innovating and achieving material reductions in their fuel pathways' carbon intensities, an effect the LCFS regulation is expressly designed to encourage.

C. California Diesel Fuel Programs

Diesel and biodiesel are regulated by multiple state agencies in California. This section gives an overview of major state regulations affecting ADF use in California.

1. ARB Regulations

As the state air pollution agency, ARB is authorized to adopt standards, rules, and regulations to achieve the maximum degree of emission reduction possible from vehicular and other mobile sources in order to accomplish the attainment of the State

ambient air quality standards at the earliest practicable date. ARB regulations can be found under California Code of Regulations *(CCR) Division 3, Titles 13 and 17.*

a. California Reformulated Diesel Fuel

In November 1988, the Board approved regulations limiting the allowable sulfur content of motor vehicle diesel fuel to 500 parts per million by weight (ppmw) statewide and the aromatic hydrocarbon content to 10 percent by volume with a 20 percent limit for small refiners. These diesel fuel regulations, which became effective in 1993, are a necessary part of the State's strategy to reduce air pollution through the use of clean fuels, lower-emitting motor vehicles, and off-road equipment. The regulation limiting the aromatic hydrocarbon content of diesel fuel includes provisions that enable diesel fuel producers and importers to comply through alternative diesel formulations that may cost less. The alternative specifications must result in the same emission benefits as the 10 percent aromatic standard (or in the case of small refiners, the 20 percent standard).

On July 24, 2003, the Board approved amendments to the California diesel fuel regulations. The amendments reduced the sulfur content limit from 500 ppmw to 15 ppmw for diesel fuel sold for use in California in on-road and off-road motor vehicles starting in mid-2006. The lower sulfur limit aligned the California requirement with the on-road diesel sulfur limit adopted by the U.S. EPA, but expanded the limit to include off-road motor vehicle diesel fuel. The new sulfur standard enabled the use of the emissions control technology required to ensure compliance with the new emissions standards adopted by the U.S. EPA for 2007 and subsequent model-year heavy-duty engines and vehicles.

In 2005, the Board also adopted a measure that applied the diesel fuel standards to harborcraft and intrastate locomotives.

b. Alternative Fuels

"Alternative fuel" generally means any motor vehicle transportation fuel that is not gasoline or diesel fuel. This includes, but is not limited to, those fuels that are commonly or commercially known or sold as one of the following: M-100 fuel methanol, M-85 fuel methanol, E-100 fuel ethanol, E-85 fuel ethanol, biodiesel, compressed natural gas (CNG), liquefied natural gas (LNG), liquefied petroleum gas (LPG), or hydrogen.

The quality of alternative motor vehicle fuels is subject to ARB-approved composition specifications under Title 13, California Code of Regulations, Sections 2291.1 through 2292.6, as follows:

- M-100 fuel methanol (13 CCR §2292.1),
- M-85 fuel methanol (13 CCR §2292.2),
- E-100 fuel ethanol (13 CCR §2292.3),
- E-85 fuel ethanol (13 CCR §2292.4),

- compressed natural gas (13 CCR §2292.5), and
- liquefied petroleum gas (13 CCR §2292.6).

Biodiesel is considered to be an alternative diesel fuel, but there are currently no ARB standards for biodiesel fuel.

2. SWRCB Regulations

The California State Water Resources Control Board (SWRCB) regulates the storage of diesel and biodiesel in Underground Storage Tanks (UST). These tanks must undergo compatibility testing by an independent certification lab, such as Underwriters Laboratory, for any new fuel that may be stored in them. B5 has undergone such a certification. Fuels above B6 have not undergone independent certification and there is no current activity to obtain certification.

3. CDFA-DMS Regulations

The Division of Measurement Standards (DMS) of the California Department of Food and Agriculture (CDFA) regulates diesel and biodiesel for compliance with California specifications and measurement. DMS is statutorily obligated to adopt specifications for new fuels when an independent specification organization, such as ASTM, sets specifications for that fuel.

In 2008, ASTM international adopted three biodiesel specifications. First, ASTM updated its specifications for B-100 blendstock, D6751-08, "Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels." Second, ASTM approved revisions to D975-08, "Standard Specification for Diesel Fuel Oils," which would subject biodiesel blends from B-1 to B-5 to the same specification as regulation diesel fuel. Finally, ASTM adopted new fuel specifications for B-6 to B-20 in D7467-08, "Standard Specification for Diesel Fuel Oil Biodiesel Blend (B6 to B20)."

DMS has adopted *ASTM D6751-08 Standard Specification for Biodiesel fuel Blend Stock (B100) for use in Middle Distillate Fuels.* DMS has not yet adopted *ASTM D7467-08 Standard Specification for Diesel Fuel Oil, Biodiesel Blend (B6 – B20).*

4. OSFM Regulations

The Office of the State Fire Marshal regulates diesel and biodiesel storage, dispensing, and vapor recovery. All diesel and biodiesel facilities must follow California building and fire code and adhere to the specific provisions regarding diesel and biodiesel.

5. Air Quality Improvement Program (AB 118)

The Air Quality Improvement Program (AQIP), administered by ARB, is a voluntary incentive program created under the *California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007* (Assembly Bill (AB) 118;

Núñez, Chapter 750, Statutes of 2007). Through AQIP, ARB invests in clean vehicle and equipment projects that reduce criteria pollutant and air toxic emissions, often with concurrent climate change benefits. AQIP provides funding for projects not covered by other ARB incentive programs and have supported the initial deployment of hybrid and zero-emission trucks, zero-emission and plug-in hybrid passenger cars, and demonstrated other advanced technologies critical to meeting California's long-term air quality and climate change goals. The AQIP Guidelines and annual funding plans guide ARB's implementation of AQIP. There is a companion program administered by the California Energy Commission (CEC) pursuant to its authority under AB 118. The CEC's program is governed by its AB 118 Investment Plan, through which the CEC has provided nearly $26 million to date in funding for production and infrastructure projects involving diesel substitutes, including biodiesel and renewable diesel.[1]

[1] California Energy Commission, 2013-2014 Investment Plan Update for the Alternative and Renewable Fuel and Vehicle Technology Program, Table ES-1, p. 5, May 2013

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CHAPTER 4. FEDERAL POLICIES AFFECTING MOTOR VEHICLE DIESEL FUEL

This chapter summarizes various Federal policies that affect motor vehicle diesel fuel and may specifically impact the ADF regulation. The policies covered in this chapter include pertinent federal fuel regulations, standards, and requirements.

A. Federal Fuel Registration

U.S. EPA regulations establish fuel registration and formulation requirements. U.S. EPA requires that all diesel fuels and fuel additives for on-road motor vehicle use be registered in accordance with 40 CFR Part 79. To become registered, a new fuel must apply for registration and meet "substantially similar" requirements. The "substantially similar" requirement means that the fuel must be of mostly the same composition as the fuel it is displacing, in this case diesel. Any biodiesel used in California must also be registered as a fuel with U.S. EPA.

The registration requirements for diesel fuels apply to fuels composed of more than 50 percent diesel fuel by volume, and their associated fuel additives. Manufacturers may enroll a fuel or fuel additive in a group of similar fuels and fuel additives through submission of jointly-sponsored testing and analysis, conducted on a product which is representative of all products in that group.

B. Federal Regulations Affecting Diesel Fuel Quality

U.S. EPA motor vehicle diesel fuel standards, contained in 40 CFR Part 80 Subpart I, requires on-road motor vehicles diesel fuel to have a sulfur content of no greater than 15 ppm. In addition, the regulation requires a cetane index of at least 40 or an aromatic hydrocarbon content of no greater than 35 volume percent. All on-road motor vehicle diesel fuel sold or supplied in the United States, except in Alaska, must comply with these requirements.

The diesel fuel sulfur regulations require refiners, importers, distributors, and retailers who produce, import, sell, store, or transport diesel fuel to meet the standards specified in the diesel regulations. Sulfur standards were phased in from 2006 to 2010, and were designed to ensure widespread availability of highway diesel fuel containing 15 ppm sulfur or less.

C. Federal Renewable Fuels Standard

Congress adopted the RFS in 2005 and strengthened it (RFS2) in December 2007 as part of the Energy Independence and Security Act of 2007 (EISA). The RFS2 contains, among other provisions, requirements for increasing volumes of biofuels every year, up to a required volume of 36 billion gallons by 2022. Of the 36 billion gallons, 16 billion gallons must be advanced biofuels from cellulosic sources. Successful implementation

of the RFS2 will result in significant quantities of low carbon intensity biofuels that could be used toward compliance with California's LCFS. In addition, successful implementation would also signal that the necessary technological breakthroughs to produce second and third generation biofuels have occurred.

1. Renewable Fuel Volume Requirements

The RFS2 requires fuel producers to use a progressively increasing amount of biofuel, culminating in at least 36 billion gallons of biofuel by 2022. The U.S. EPA must establish regulations to ensure that the transportation fuel sold in, or imported into, the United States contains at least the applicable quantity of renewable fuels. Responsible parties under the U.S. EPA regulations relating to biofuels include refiners, blenders, and importers of gasoline. The total volume of renewable fuel required in the U.S. in 2009 is 9.0 billion gallons. RFS2 differentiates between "conventional biofuel" (corn-based ethanol) and "advanced biofuel." Advanced biofuel is renewable fuel, other than corn-based ethanol, with lifecycle greenhouse gas emissions that are at least 50 percent less than greenhouse gas emissions produced by gasoline or diesel. Starting in 2009, a progressively increasing portion of renewable fuels must be advanced biofuels, such as cellulosic ethanol.

2. Renewable Fuels GHG Requirements

The RFS2 requires GHG reductions for the various categories of renewable fuels, but only in discrete "bins" (e.g., both advanced biofuel and biomass-based diesel must achieve a life-cycle GHG emission-reduction threshold of 50 percent). This federal program does not use a carbon intensity standard like the LCFS. As noted, there are specific requirements for the different classifications of renewable fuels. In general, these specifications are set relative to the baseline lifecycle GHG emissions for gasoline and diesel fuel sold or distributed in 2005. The lifecycle GHG emissions are specifically defined as:

"The term 'lifecycle greenhouse gas emissions' means the aggregate quantity of greenhouse gas emissions (including direct emissions and significant indirect emissions such as significant emissions from land use changes), as determined by the Administrator, related to the full fuel lifecycle, including all stages of fuel and feedstock production and distribution, from feedstock generation or extraction through the distribution and delivery and use of the finished fuel to the ultimate consumer, where the mass values for all greenhouse gases are adjusted to account for their relative global warming potential."[2]

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[2] *Energy Independence and Security Act of 2007*, Title II-Energy Security Through Increased Production of Biofuels; Subtitle A Section 201 (H)

There are four general classifications of renewable fuels defined in RFS2: renewable fuels, advanced biofuels, cellulosic biofuels, and biomass-based diesel.

3. Renewable Biomass Definition

The RFS2 defines renewable fuel as fuel that is produced from renewable biomass. Renewable biomass is then defined as each of the following:

- planted crops and crop residue harvested from agricultural land cleared or cultivated and is either actively managed or fallow, and nonforested, or
- planted trees and tree residue from actively managed tree plantations on nonfederal land cleared, including land belonging to an Indian tribe or an Indian individual, that is held in trust by the United States or subject to a restriction against alienation imposed by the United States, or
- animal waste material and animal byproducts, or
- slash and pre-commercial thinning from non-federal forestlands, but not forests or forestlands that are ecological communities with a global or State ranking of critically imperiled, imperiled, or rare pursuant to a State Natural Heritage Program, old growth forest, or late successional forest, or
- biomass obtained from the immediate vicinity of buildings, camps, or public infrastructure facilities (including roads), at risk from wildfire, or
- algae, or
- separated yard waste or food waste, including recycled cooking and trap grease; and street tree and urban park trimmings.

One aspect of the definition of renewable biomass is that there are significant federal incentive funds for producing advanced biofuels. To qualify for these incentives, the renewable fuels must be produced from renewable biomass. Additional discussion of the relationship between the federal definition of renewable biomass and the LCFS is presented in Chapter 6.

4. U.S. EPA Rulemakings Implementing the RFS2

U.S. EPA is responsible for implementing the volume requirements in the RFS2. Section 211(o) of the Clean Air Act (CAA or the Act), as amended, requires the U.S. EPA Administrator to annually determine a renewable fuel standard which is applicable to refiners, importers and certain blenders of gasoline, and publish the standard in the Federal Register. Based on this standard, each obligated party determines the volume of renewable fuel that it must ensure is consumed as motor vehicle fuel. This standard is calculated as a percentage, by dividing the amount of renewable fuel that the Act requires to be blended into gasoline for a given year by the amount of gasoline expected to be used during that year, including certain adjustments specified by the Act.

U.S. EPA published a renewable fuel standard of 10.21 percent for 2009, which was intended to lead to the use of 11.1 billion gallons of renewable fuel in 2009. Note that

the 11.1 billion gallons of renewable fuel required in 2009 is projected to include approximately 0.5 billion gallons of biodiesel and renewable diesel.

In August 2013, U.S. EPA finalized the 2013 renewable fuel standards which established the 2013 annual percentage standards for cellulosic biofuel, biomass-based diesel, advanced biofuel, and total renewable fuel. To calculate the percentage standard for cellulosic biofuel for 2013, U.S. EPA used a volume of 6 million ethanol-equivalent gallons. The U.S. EPA also used the applicable volumes that are specified in the statute to set the percentage standards for advanced biofuel and total renewable fuel for 2013.[3] The volumes are shown in Table 4.1 below.

Table 4.1: Volumes Used to Determine the Final 2013 Percentage Standards

Cellulosic Biofuel	6 mill gal
Biomass-based Diesel	1.28 bill gal
Advanced Biofuel	2.75 bill gal
Renewable Fuel	16.55 bill gal

The percentage standards required under the RFS program represent the ratio of renewable fuel volume to non-renewable gasoline and diesel volume. Thus, in 2013 about 10 percent of all fuel used will be from renewable sources. The standards for 2013 are shown in Table 4.2 below.

Table 4.2: Final Percentage Standards for 2013

Cellulosic Biofuel	0.004%
Biomass-based Diesel	1.13%
Advanced Biofuel	1.62%
Renewable Fuel	9.74%

D. Federal Trade Commission Labeling Requirements

The EISA of 2007 required Federal Trade Commission (FTC) to adopt regulations pertaining to the labeling of biodiesel and biomass-based diesel at retail dispensing outlets. This regulation was enacted under Title 16, Code of Federal Regulations, Part 306.12. The regulation requires labeling of biodiesel and biomass-based diesel if the blend level is above 5 percent.

[3] U.S. Environmental Protection Agency, Office of Transportation and Quality. *EPA Finalizes 2013 Renewable Fuel Standards*, EPA-420-F-13-042. August 2013

CHAPTER 5. DESCRIPTION OF PROPOSED REGULATION

A. Overview of Proposed Regulation

The primary purpose of the proposed regulation is to control emissions from emerging ADFs in California. Additionally the proposed regulation will create a framework that allows for innovation and diversity in the California fuel pool, by setting up a staged process by which the introduction of ADFs is managed responsibly.

B. Applicability

The proposed regulation will apply to all producers, importers, and distributors of ADFs in the State of California. Fuel that meets a specification under the alternative fuels regulation 13 CCR 2292 are not considered ADFs and are thus not subject to this regulation. It is our intention that this regulation be in effect at all points of sale, offer, or supply in the California fuel distribution infrastructure.

C. Definitions

For the purposes of sections 2293 through 2293.9, the definitions in H&SC sections 39010 through 39060 shall apply, except as otherwise specified in this subarticle 1:

Section (a) covers the definitions in the regulation.

1. "Alternative diesel fuel" or "ADF" means any non-CARB diesel fuel used in a compression ignition engine that does not consist solely of hydrocarbons, and is not subject to a specification under title 13, CCR, section 2292. All ADFs that are substantially similar to an ADF subject to an approved Executive Order or MOU shall be deemed to fall within the class of ADFs subject to that same approved Executive Order or MOU.

2. "Biodiesel" means a fuel comprised of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated B100, and meeting the specifications set forth by the ASTM International in the latest version of *Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels* D6751 contained in the ASTM publication entitled: Annual Book of ASTM Standards, Section 5, as defined in 4 CCR 4140(a).

3. "Biodiesel Blend" means biodiesel blended with petroleum-based diesel fuel.

4. "Blend Level" means the ratio of an ADF to the CARB diesel it is blended with, expressed as a percent by volume. The blend level may also be expressed as "AXX," where "A" represents the particular ADF and "XX" represents the percent by volume that ADF is present in the blend with CARB diesel (e.g., a 50% by volume biodiesel/CARB diesel blend is denoted as "B50").

5. "Blendstock" means a component that is either used alone or is blended with another component(s) to produce a finished fuel used in a motor vehicle. A blendstock that is used directly as a transportation fuel in a vehicle is considered a finished fuel.

6. "B5" means a biodiesel blend containing no more than five percent biodiesel by volume.

7. "B20" means a biodiesel blend containing more than five and up to 20 percent biodiesel by volume.

8. "CARB Diesel fuel" means a light or middle distillate fuel which may be comingled with up to five (5) volume percent biodiesel, and meeting the definition and requirements for "diesel fuel" or "California nonvehicular diesel fuel" as specified in 13 CCR 2281 et seq. "CARB Diesel fuel" may include, renewable diesel; gas-to-liquid fuels; Fischer-Tropsch fuels; CARB diesel blended with additives specifically formulated to reduce emissions of one or more criteria or toxic air contaminants relative to reference CARB diesel; and CARB diesel specifically formulated to reduce emissions of one or more criteria or toxic air contaminants relative to reference CARB diesel.

9. "Criteria Pollutant" means any air pollutant for which a California ambient air quality standard (CAAQS) or a national ambient air quality standard (NAAQS) has been established. A list of air pollutants for which a CAAQS or NAAQS has been established can be found at http://www.arb.ca.gov/research/aaqs/aaqs2.pdf, which is incorporated herein by reference.

10. "Diesel Substitute" means any liquid fuel that is intended for use with CARB diesel or CARB diesel blends in a compression ignition engine. "Diesel substitute" includes, but is not limited to, renewable diesel; gas-to-liquid fuels; Fischer-Tropsch fuels; CARB diesel blended with additives specifically formulated to reduce emissions of one or more criteria or toxic air contaminants relative to reference CARB diesel; and CARB diesel specifically formulated to reduce emissions of one or more criteria or toxic air contaminants relative to reference CARB diesel.

11. "Effective ADF Blend Level" means the actual, statewide-average ADF blend level, adjusted to account for various air pollution mitigating considerations, which may include but are not limited to, the use of various diesel substitutes that reduce air emissions of the pollutant for which the significance threshold was identified (e.g., renewable diesel, which reduces NOx emissions); the fleet penetration of new technology diesel engines; composition of the feedstocks used to produce the ADF; volumes of lower-emission CARB diesel fuel, including those with emissions-reducing additives; and other factors as deemed appropriate by the Executive Officer. The effective ADF blend level is compared to the significance threshold to determine when to apply mitigation strategies for those ADFs for which the Executive Officer has identified a significance threshold.

12. "Executive Officer" means the Executive Officer of the Air Resources Board, or his or her designee.

13. "Executive Order" means the document signed by the Executive Officer, or his or her designee, which specifies the stage at which a regulated party(ies) for an ADF is or will be operating under, as provided in this subarticle, and any enforceable terms, conditions, and requirements applicable to the regulated party(ies) must meet in order to sell, offer for sale, or supply that ADF for use in California.

14. "Finished Fuel" means a fuel that is used directly in a vehicle for transportation purposes without requiring additional chemical or physical processing.

15. "Hydrocarbon" means any chemical or mixture that is composed solely of hydrogen and carbon.

16. "Importer" has the same meaning as defined in the Low Carbon Fuel Standard (17 CCR 95481(a)).

17. "LCFS" means the Low Carbon Fuel Standard (17 CCR 95480—95490).

18. "Memorandum of Understanding (MOU)" means an enforceable agreement, executed between the Executive Officer and an applicant(s), which meets the requirements of this subarticle and specifies the terms and conditions by which the ADF at issue will be sold and used in California. MOUs issued under this subarticle are not subject to the Board's reservation of powers pursuant to Board Resolution 78-10[4] (February 23, 1978) or Resolution 05-40[5] (July 21, 2005).

19. "Multimedia Evaluation" has the same meaning as defined in H&SC section 43830.8(b).

20. "Multimedia Evaluation Guidance Document" means the procedure governing the Executive Officer's multimedia evaluation conducted prior to establishing a motor vehicle fuel specification. The multimedia evaluation guidance document ("Guidance Document and Recommendations on the Types of Scientific Information Submitted by Applicants for California Fuels Environmental Multimedia Evaluations") is available at www.arb.ca.gov/fuels/multimedia/guidancedoc.pdf, which is incorporated herein by reference.

21. "New Technology Diesel Engine (NTDE)" means a diesel engine that meets at least one of the following criteria:

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[4] California Air Resources Board, *Board Resolution 78-10, 1978*

[5] California Air Resources Board, *Board Resolution 05-10*, 2005

(1) 2010 ARB emission standards for on-road heavy duty diesel engines under 13 CCR 1956.8,
(2) Tier 4 emission standards for non-road compression ignition engines under 13 CCR 2421, 2423, 2424, 2425, 2425.1, 2426, and 2427, or
(3) equipped with or employs a Diesel Emissions Control Strategy (DECS), verified by ARB pursuant to 13 CCR 2700 et seq., which uses selective catalytic reduction to control NOx.

22. "Non-ester renewable diesel" means a diesel fuel that is produced from nonpetroleum renewable resources but is not a mono-alkyl ester and which is registered as a motor vehicle fuel or fuel additive under 40 CFR Part 79, as amended by Pub. L. 91-604.

23. "Non-ester renewable diesel blend" means non-ester renewable diesel blended with petroleum-based diesel fuel.

24. "Non-petroleum renewable resources" means non-fossil fuel resources including but not limited to biomass, waste materials, and renewable crude.

25. "Performance Criteria" means a list of indicators, including but not limited to the total volume and volume percent represented by an ADF's sales in California, that are specified by the Executive Officer for use in determining whether the significance level for a pollutant has been reached or will be reached.

26. "Person" has the same meaning as defined in Health and Safety Code section 39047 and includes, but is not limited to, alternative diesel fuel producers, importers, marketers and blenders. "Person" includes the plural when two or more persons are subject to an Executive Order or MOU executed or an interim or final fuel specification issued pursuant to the requirements of this subarticle.

27. "Producer" has the same meaning as defined in the Low Carbon Fuel Standard (17 CCR 94581(a)).

28. "Reference CARB Diesel" has the same meaning as "reference fuel" as that term is defined in 13 CCR 2282(g)(3).

29. "Significance Level" means, for a given air pollutant X, either of the following, whichever applies:

(1) For an ADF blended with CARB diesel, the significance level means the blend level of the ADF below which the combined effects of:

i. the use of the ADF in new technology diesel engines, and
ii. the use of diesel substitutes that reduce emissions of X

result in no increase in the emissions of X.

(2) For an ADF used as a neat fuel, the significance level means any use of the ADF below which there is no increase in the emissions of X.

30. "Toxic Air Contaminant" means any substance identified or designated by the Air Resources Board as a toxic air contaminant pursuant to Health and Safety Code sections 39655 or 39657, or is designated as a hazardous air pollutant under section 112 of the federal Clean Air Act (42 U.S.C 7412).

31. "Trade Secret" has the same meaning as defined in Government Code section 6254.7.

Section (b) is a glossary of acronyms used in the regulation.

D. Applicable Requirements for Alternative Diesel Fuels

As ADFs are introduced into California, it is the goal of this regulation to ensure that there are no detrimental impacts of those fuels to the environment. This regulation relies on a 3-stage introduction of ADFs to commerce, through which the environmental impacts will be determined in a way that minimizes potential risk to Californians.

1. Stage 1 (Pilot Program)

The first stage of this regulation is referred to as a pilot program. Any new ADF proponent may apply for a pilot program in order to begin testing of their fuel in California. The pilot program will limit the amount of a new ADF not to exceed the energy equivalent of one million gallons of diesel fuel used in well-defined fleets, and will last for one year, with three opportunities to renew for six months each. The application for a pilot program includes public disclosure of a multitude of properties of the fuel that may affect its impact to the environment. The EO will use this information to conduct a preliminary review of the fuel to determine whether it is appropriate for use and if risks due to the use of the fuel in a pilot program are outweighed by the potential benefits of the fuel.

If the EO finds that the pilot program is appropriate he or she will then enter into a Memorandum of Understanding (MOU) with the applicant. The MOU will contain terms and conditions of additional testing that the EO finds to be necessary based on the properties of the fuel. Completion of the terms of the MOU will be required prior to advancing to Stage 2. Applicants under a Stage 1 MOU will also be required to submit quarterly reports on how much fuel is being used.

2. Stage 2 (Fuel Specification Development)

Once an ADF proponent completes the terms of a Stage 1 MOU, they may apply for an updated MOU to move to Stage 2. The MOU that establishes Stage 2 for that fuel proponent will include a limit on the amount of that fuel that may be sold in the state, to

be determined by the EO but not to exceed the energy equivalent of 30 million gallons of diesel.

During Stage 2, an ADF would be required to: (1) complete a multimedia evaluation, (2) achieve adoption of consensus standards, (3) obtain approval for use from 75 percent of engine manufacturers who produce engines in which the ADF is expected to be used, and (4) identify appropriate specifications for the fuel.

During Stage 2, the EO would complete analysis of the emissions data assembled during a multimedia evaluation to determine whether the fuel or fuel blends have a significance level which would contribute additional air pollution to California. If the EO determines that there is no significance level, the ADF would then be eligible to advance to Stage 3B. If, however, the EO determines a significance level for the ADF or ADF blends, the ADF would be eligible to advance to Stage 3A.

3. Stage 3 (Commercial Sales)

After completing the requirements of Stage 2, an ADF proponent may apply to the EO to move their fuel to Stage 3. If a significance level was found under Stage 2, the EO may advance the fuel to Stage 3A. If the fuel was found to have no adverse emissions impacts the EO may advance the ADF to Stage 3B. In Stage 3B, there are no limits on the fuel volumes a proponent may sale or supply for use in California.

Stage 3A consists of monitoring a fuel to see if its effective blend level has reached its significance level. Its effective blend level is calculated by an equation determined during stage 2 considering both the volume of the fuel used, and any mitigating factors found to be used concurrently. Once the effective blend level of an ADF is found to be 95 percent of the significance level, mitigation measures for that ADF are triggered.

Stage 3B consists of reporting and recordkeeping for an ADF after it has been determined that the ADF or specific blends of the ADF do not have a significance level.

E. Biodiesel as an Alternative Diesel Fuel

Biodiesel will have completed all of the relevant steps that are outlined in Stage 2 of the proposed regulation by the time this regulation is in full effect, and thus will be regulated at Stage 3. There are two distinct blend levels relative to biodiesel that have been identified as important for this analysis. Based on our analysis to date, we have found that diesel blends with less than 10 percent biodiesel by volume (<B10) have no significant increase in any of the pollutants of concern and therefore will be regulated at Stage 3B (Commercial Sales not Subject to Mitigation). However, we have found that biodiesel blends of 10 percent and above (≥B10) have potentially significant increases in NOx emissions, in the absence of any mitigating factors, and therefore those higher blend levels will be regulated under Stage 3A (Commercial Sales Subject to Mitigation).

As noted elsewhere, there are a number of mitigating factors (e.g., increasing penetration of new technology diesel engines, renewable diesel, animal feedstock-derived biodiesel, etc.) that are already occurring in the market which, in the aggregate, negate the NOx effects in the unlikely event that higher biodiesel blends are used in legacy, heavy-duty diesel vehicles. We project these factors to continue and grow through the early 2020s, by which time the heavy-duty vehicle fleet will comprise nearly all new technology diesel engines that show no potential NOx increases from using biodiesel. Even with these already-occurring mitigating factors, it is nevertheless important that biodiesel is sold in California under the Stage 3A market requirements. This will ensure that the existing air quality protections are maintained in all reasonably foreseeable circumstances.

Under the proposal, ADFs that are regulated under Stage 3A are required to have emissions mitigation measures in place and ready to be triggered if and when the effective blend level for that ADF has nearly reached the significance threshold for a pollutant of concern for that ADF. For example, mitigation measures established in the proposal will automatically become effective for producers, importers, and other suppliers of biodiesel if and when the biodiesel effective blend level reaches a statewide average of 9.5 percent. This criterion is established on a statewide average basis for a number of reasons:

- The statewide average effective blend level is representative of the average effective blend levels at the regional (i.e., air basin) level;

- Because of economic, OEM warranty, and other reasons, biodiesel sales tend to occur at the lowest possible blend, which is currently no more than B5 (nominal) statewide. In 2012, the nominal statewide blend level was far below 10 percent; indeed, it was about 0.5 percent, and this does not even account for the already-occurring mitigating factors noted previously. Further, biodiesel blends above B10 are generally priced higher than conventional CARB diesel. Thus, it is highly unlikely that operators of legacy heavy-duty fleets will purchase high biodiesel blends that are generally more expensive than conventional CARB diesel (i.e., B5 and below) while potentially raising engine warranty issues;

- It would be impractical to determine the individual blend level for each gallon of biodiesel blend being sold across the State. To do so would require the retailers and marketers of biodiesel blends (i.e., the diesel dispensing facilities) to continuously test and determine the biodiesel blend level for each of the approximately 3 billion gallons of on-road diesel fuel sold in California each year;

By the same token, it would also be impractical to determine the individual blend level of fuels that mitigate NOx emissions, renewable diesel, low-NOx diesel, animal-based biodiesel, and NOx-reducing additives for each gallon of diesel fuel sold in California. For these reasons, any blend level other than a statewide average effective-blend level would be impractical and unnecessary, while the effective biodiesel blend level remains far below 9.5 percent, as it currently stands. However, the proposal strikes the proper

balance between imposing costly monitoring while the biodiesel effective blend level remains very low, and not having sufficient monitoring data to identify if and when the effective blend level reaches a level of concern. The proposal achieves this balance by requiring the calculation of the effective blend level on an annual statewide average basis until the effective blend level reaches 7.5 percent. At that point, the biodiesel producers, importers, blenders, and other suppliers are put on notice that the effective blend-level trigger of 9.5 percent is approaching and mitigation measures will be required once the trigger is reached. In addition, at that point the proposal would require each of those parties to begin enhanced monitoring and reporting on a monthly basis of specified information, including:

- The volume of ADF and ADF blend offered, supplied, or sold during each month;
- Fuel property test results for a specified number of representative samples;
- The volume/amount of each mitigation strategy being employed each month and the blend rate of each of those mitigation strategies used in each month.

As part of its ongoing fuels enforcement program, ARB also intends to conduct periodic sampling of diesel fuel sold in the State, including the South Coast, San Joaquin Valley, and other regions. This sampling will include testing and analysis not only of ADF blend levels such as the biodiesel content in the chosen samples, but also an analysis of the mitigating factors contained in the fuel samples and occurring in the fuels market. ARB staff intends to conduct this sampling and testing both before and after the effective blend level of 7.5 percent is reached. Altogether, these enhanced monitoring, reporting, and testing measures will further assure that the already-occurring mitigating factors and any imposed mitigation strategies are, in the aggregate, maintaining the existing air quality protections provided by the CARB diesel fuel regulations.

CHAPTER 6. TECHNOLOGY ASSESSMENT

In this chapter, we discuss the technological feasibility of the proposed regulation. Primarily the discussion will revolve around the ability of ADF producers to comply with the mitigation provisions and the enforcement provisions of the proposed regulation. Since biodiesel is the first commercial ADF, we will spend a majority of the chapter discussing the technological feasibility of the mitigation options as they pertain to biodiesel.

A. Emerging Diesel Fuel Substitutes

1. Biodiesel

Biodiesel is a fuel composed of a mixture of fatty acid alkyl esters, usually FAME, which can be made from almost any plant oil or animal fat. "Bio" refers to the biological source of the fuel in contrast to traditional hydrocarbon diesel fuel. Biodiesel is an ADF that can be blended with hydrocarbon diesel or used unblended as B100. Biodiesel fuel blends are designated as "BX" where "X" is the percent biodiesel by volume in the fuel. Biodiesel is registered as a fuel and fuel additive with the U.S. EPA.[6] As staff will point out later, biodiesel is considered to be in Stage 3A of this proposed regulation.

2. Hydrocarbon Diesel Fuel Substitutes

Renewable diesel fuel can be produced from the same feedstocks as biodiesel; animal fats and vegetable oils. However, the processing and resultant products are different. The typical renewable diesel production process consists of hydrogenation of the animal fats and vegetable oils, as well as refining similar to petroleum refining. Renewable diesel fuel is chemically indistinguishable from conventional petroleum diesel fuel, and is not considered an ADF.

Renewable diesel has several advantages over biodiesel and conventional diesel. Renewable diesel has a superior emission profile. Usage of renewable diesel results in reduced particulates, NOx, hydrocarbons, and CO emissions compared to conventional diesel. Unlike FAME biodiesel, the production of renewable diesel through the fatty acids to hydrocarbon process does not produce a glycerin co-product. Renewable diesel can be produced using existing hydrotreatment process equipment in a petroleum refinery. There are several commercial renewable diesel ventures such as Amyris' Biotane, Global Energy Resources' renewable hydrocarbons, REEP Development's celluloisic diesel and Sierra Energy's biomass to liquid fuels.

[6] California Air Resources Board, *Proposed Regulation to Implement the Low Carbon Fuel Standard, Volume II, Appendix B: Supporting Documentation for the Technology Assessment*, March 5, 2009

Neste has developed a plant to process vegetable and animal fats into renewable diesel by the hydrotreatment process in Singapore with a production capacity of 240 million gallons per year.[7]

Dynamic Fuels, a joint venture of Syntroleum and Tyson Foods, is currently producing renewable diesel and has a production capacity of 75 million gallons per year.[8]

Diamond Green Diesel, a joint venture between Darling and Valero, is currently producing renewable diesel and has a production capacity of 137 million gallons per year.[9]

Emerald Biofuels plans to build a renewable diesel facility using the Honeywell process, with a production capacity of 85 million gallons per year.[10]

3. Dimethyl Ether

Among the newer diesel fuel substitutes to enter California is dimethyl ether (DME). DME is a gaseous fuel that is stored as a liquid, and has properties similar to those of liquid petroleum gas, or propane as it is better known. DME is produced from methane by syngas formation and conversion to methanol followed by dehydration. DME has already started the Multimedia Evaluation process and is expected to be in Stage 2 by the time this regulation becomes effective.

B. Biodiesel as an ADF

1. Overview of Current Production Technology

The process used to convert virgin oils or animal fats into biodiesel is called transesterification and involves mixing the oil or fat with alcohol and a catalyst, usually lye. Transesterification can be used to convert either plant oil or animal fats to biodiesel.

Raw vegetable and animal oils consist primarily of triacylglycerides, commonly known as triglycerides. Structurally, triglycerides are composed of three fatty acids attached to a glycerol molecule. Though these oils can be directly used in diesel engines, engine manufacturers generally discourage this practice, as their use can cause engine

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[7] Biofuels Digest, December 3, 2010, *Neste Oil becomes Chief Monster as renewable diesel becomes biofuels monster*, http://www.biofuelsdigest.com/bdigest/2010/12/03/neste-oil-becomes-chief-monster-as-renewable-diesel-becomes-biofuels-monster/ (accessed September 17, 2013)

[8] Dynamic Fuels, http://www.dynamicfuelsllc.com/about.aspx (accessed June 28, 2013)

[9] DAR PRO Diamond Green Diesel Renewable Fuel, *Thinking big: A partnership with Valero Energy Corporation for mass-scale green diesel production,* http://www.darpro.com/diamond-green-diesel (accessed June 28, 2013)

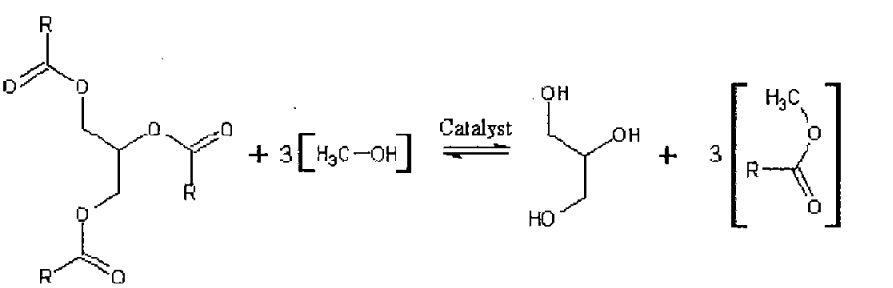
[10] Emerald Biofuels News, *Emerald Biofuels Plans Renewable Diesel Refinery in Plaquemine, Louisiana,* May 8, 2012, http://emeraldbiofuels.com/news.php (accessed June 28, 2013)

problems. This is primarily because combustion of raw oils form engine deposits, with carbon residue and plugging in engine injector nozzles, piston rings, and lubricating oil. This happens due to polymerization of the triglycerides in the raw oils as the fuel is combusted. Converting the raw oils into a form of esters or biodiesel prevents these issues.

Before transesterification is conducted, the raw oils and fats are filtered and pretreated to remove water and contaminants. Water in the feedstock leads to the formation of soaps, which are an undesirable by-product, reduces the yield of biodiesel, and makes the separation of glycerin in the products more difficult.

As shown in Figure 6.1, transesterification involves reacting triglyceride oils with alcohol (usually methanol) in the presence of a catalyst (usually lye) in a simple closed reactor system at low temperature and pressure. The products of the transesterification reaction are FAME and glycerin as a co-product. After transesterification, a majority of the alcohol is removed from the glycerin and recycled back into the system to continue the process. The biodiesel from the process is purified and washed to remove any residual catalyst and soaps. The glycerin from transesterification can be purified and sold to the pharmaceutical or cosmetic industry to be processed into lotions and creams.

Figure 6.1: Transesterfication Reaction



Triglyceride Methanol (3) Glycerol Methyl Esters (3)

There are two basic conversion routes for FAME production, base and direct acid catalyzed transesterification. The base catalyzed option tends to be the most economical for virgin oil feedstocks and as such is most commonly used to produce esters on a commercial scale. The processing equipment operates at relatively lower temperatures and pressures. The process has high conversion rates (around 98%) to FAME with low reaction times without producing intermediate compounds.

Acid catalyzed transesterification is expected to be the preferred method for conversion of waste oils, since it is less sensitive to free fatty acids in the feedstock. This conversion method seems to be more economical than base catalyzed transesterification of waste oils, because an extra pretreatment step is required to remove fatty acid impurities before the base catalyzed process. For base transesterification the fatty acid content of feedstocks must generally be less than

four percent. Acid catalyzed transesterification has not been optimized for commercial scale production.

In base catalyzed transesterification, a strong base of sodium hydroxide or potassium hydroxide is usually used as the catalyst for the reaction. In the acid catalyzed process, sulfuric acid is usually used as the catalyst. For the base catalyzed process the molar ratio of methanol to oil is about 6:1, while for an acid catalyzed process the ratio is about 50:1.

The purity and the yield of biodiesel from transesterification is affected by the molar ratio of glycerides to alcohol, the type of catalyst, the reaction time, the reaction temperature, the amount of free fatty acids, and the amount of water present in the feedstock. Both purity and yield affect the amount of cleanup that must be performed on the finished product.

a. Feedstocks

In the U.S., there are many potential plant oil feedstocks that can be used including soybean, peanut, canola, cottonseed and corn oil. Most of the world's production of biodiesel comes from plant oils such as soybean, rapeseed (canola), and palm oil. About 55 percent of U.S. biodiesel was made from soybean oil feedstocks in 2012[11].

Biodiesel can also be made from waste feedstocks such as waste vegetable oil (WVO) and tallow. These feedstocks are wastes, so there are no GHG emissions due to land use change associated with these feedstocks. Biodiesel from wastes is sometimes referred to as advanced biodiesel in order to differentiate it from crop-based biodiesel because of its lower carbon intensity.

b. Fuel Quality

According to the Coordinating Research Council, Inc. (CRC) Report No. AVFL-17, *Investigation of Biodistillates as Potential Blendstocks for Transportation Fuels, released in June 2009,* "One of the biggest concerns of the biodiesel industry is the quality of finished fuels being used in the marketplace. The use of poor quality fuels can lead (and has led) to field problems and customer complaints, which reduce public confidence and jeopardize the future of the industry. Steps to address these concerns have been taken in recent years by adoption (or modification) of ASTM D 6751 (for B100) and D 7467 (for B6-B20), and by development of the BQ-9000 Quality Management System. Fuel quality surveys have indicated that problems with blending control and off-spec products were common in the past. However, it appears that with more stringent fuel specifications and increasing producer experience, the overall quality of biodiesel in the marketplace is improving."

Ensuring oxidative stability of biodiesel in the marketplace is a major product quality concern. Due to the complex degradation pathways involved, no single test method is

[11] U.S. Department of Energy, *Annual Energy Outlook 2012 with Projection to 2035,* June 2012

fully able to assess fuel stability in all circumstances. One of the most widely utilized test methods is the Rancimat oxidative stability test (EN 14112), which is based upon detection of volatile, secondary oxidation products that result from reaction of biodiesel with oxygen at elevated temperature. The Rancimat test was incorporated in 2007 in the ASTM standard specifications for B100. This test was originally developed as an indicator of vegetable oil storage stability, but is also regarded as a suitable means to assess storage stability of biodiesel and its blends. (Another oxidation stability test, prEN 15751, has been provisionally accepted.)

For many users, low temperature operability is the greatest biodiesel concern, particularly during cold seasons of the year. Just as with conventional diesel fuel, precautions must be taken to ensure satisfactory low temperature operability of biodiesel and its blends. These concerns are often greater with biodiesel, due to its higher cloud point and pour point compared to petroleum diesel. Poor low temperature operability may be exhibited in several ways, but principally by filter plugging due to wax formation, and engine starving due to reduced fuel flow.

As with fuel stability, there is no single best test to assess low temperature operability. U.S. fuel standards do not include explicit specifications for low temperature operability – either for conventional diesel or biodiesel (or blends of the two). However, the fuel seller is generally required to give an indication of low temperature operability by reporting the cloud point (CP) of the fuel. Also, a cold-soak filterability standard test method for B100 is under development by ASTM. Beginning in 2008, ASTM D 6751 required test method 'Annex A1' to assess cold soak filterability of B100 intended for blending with diesel.

Poor low temperature operability is usually caused by long-chain saturated fatty acid esters present in biodiesel. In general, the longer the carbon chain, the higher the melting point, and poorer the low temperature operability. The presence of carbon–carbon double bonds significantly lowers the melting point of a molecule (hydrocarbon or fatty acid alkyl ester). Therefore, to a certain degree, a trade-off exists between fuel stability and low temperature operability. With increasing degree of unsaturation, stability decreases but low temperature operability improves.

In large part, the fatty acid composition of the fats and oil precursors to biodiesel dictate the low temperature operability of the final fuels. Feedstocks with highly saturated fatty acid structures (such as palm oil and tallow) produce biodiesels with poor operability; whereas feedstocks with highly unsaturated fatty acid structures (such as rapeseed and safflower oil) have better operability. Proper choice of feedstocks is critical to providing a finished biodiesel fuel having acceptable low temperature operability.

Other approaches that are helpful in particular circumstances include the following:

- Blending with petroleum diesel;
- Use of commercial petroleum diesel additives;
- Use of new cold flow improver (CFI) additives for biodiesel;

- Use of higher alcohols (including ethanol) for transesterification; or
- Crystallization fractionation (wax removal).

Water solubility and water contamination are other issues of concern. At room temperature, water is very slightly soluble in conventional diesel fuel (<100 ppm), but has significant solubility in B100 (up to 1200 ppm). Water solubility in B20 is intermediate between these two extremes. The generally higher water levels in biodiesel can exacerbate problems with corrosion, wear, suspension of solids, and microbial growth. When dealing with biodiesel, extra 'housekeeping' precautions may be necessary to remove excess water and sediment. In particular, this is required when first introducing biodiesel into tanks previously used for conventional diesel, as accumulated water and sediment may become dispersed and plug filters under these conditions.[12]

c. Availability

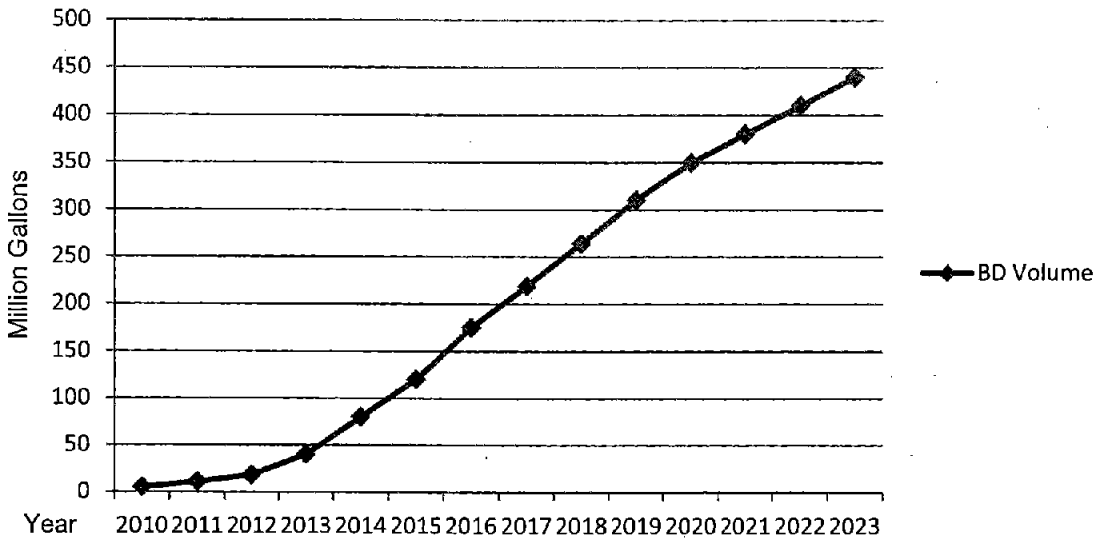
According to Biodiesel Magazine, as of June 2013 there were 193 operational commercial biodiesel production plants in the U.S. with a total production capacity of 2.9 billion gallons. There are about 20 major plants in California with annual production capacities varying between 350,000 gallons to 25 million gallons. The total biodiesel production capacity in California is nearly 78 million gallons per year. This compares to total conventional diesel production of about 3.5 billion gallons per year.

According to the Low Carbon Fuel Standard Reporting Tool (LRT), California biodiesel production facilities produced about 20 million gallons of biodiesel in 2012. Staff has communicated with many of the stations that sell biodiesel as well as the major terminal operators in the state, and has found that the vast majority of the biodiesel currently being sold in California and expected to be sold in the future is sold as blends of B5 or less.

Staff has projected how much biodiesel will be available in California from 2013 to 2023 based on current market penetration and potential for growth. The projection in Figure 6.2 below is lower than projections produced by the National Biodiesel Board (NBB), but higher than a linear interpolation of the data contained within the LRT, in other words staff expects the rate of biodiesel growth to increase in the coming years.

[12] Coordinating Research Council, Inc.,Report No. AVFL-17, Alpharetta, Georgia, pp. 16-18, *Investigation of Biodistillates as Potential Blendstocks for Transportation Fuels*, June 2009

Figure 6.2: Statewide Biodiesel Volume



*2010 data from BOE, 2011-12 data from LRT, 2013-23 projected

d. Literature Search

Multiple studies have looked at the impact of biodiesel on heavy-duty diesel vehicle NOx emissions. The National Renewable Energy Lab (NREL) and the U.S. EPA have both examined the literature to determine these effects. Neither of these databases focused primarily on the effects of using CARB diesel as the base fuel. To fill this knowledge gap, ARB staff conducted a literature search that addresses the impacts of biodiesel use on NOx emissions in heavy duty engines using California diesel as the base fuel. The details of staff's literature review are included in Appendix B.

The literature search focused on biodiesel blends B20 and below and characterized studies by their baseline fuel properties. Studies that used either explicitly CARB diesel or a diesel fuel that was tested to have a cetane number of at least 49 were included in the analysis. The studies included in this analysis were all performed using an engine dynamometer with commercially available engines, and no engine modifications. Studies using test cycles based on a single speed and mode were excluded from this analysis.

Each set of tests in a study using the same engine and test cycle were considered to be an individual data point, and each of these data points were weighted equally. Table 6.1 shows the results of the analysis completed by staff.

It should be noted that this testing demonstrate the results only for a specific fuel formulation on specific engines in controlled laboratory conditions. To translate this to any potential real-world emission impact requires consideration of many factors (e.g., number of NTDE engines, amount of renewable and low-NOx diesel, amount of animal-based biodiesel, and any NOx-reducing additives). These factors are captured in an "effective blend" value that is discussed later in section 6.A.h

Table 6.1: Results of Literature Search Analysis

Biodiesel Blend level	NOx Difference	Standard Deviation
B5	0.3%	1.3%
B10*	2.7%	0.2%
B20	3.2%	2.3%

*Represents data using biodiesel from soy feedstocks.

Overall, the testing indicates different NOx impacts at different biodiesel percentages. Staff analysis shows there is a wide statistical variance in NOx emissions at biodiesel levels of B5, providing no demonstrable NOx emissions impact at this level and below. At biodiesel levels of B10 and above, multiple studies demonstrate statistically significant NOx increases, without additional mitigation. A worst-case analysis using soy feedstock biodiesel shows an emissions increase of about 2.7 percent at B10. (NOx emissions of soy biodiesel are 2.2 times greater than biodiesel from animal feedstocks at B10, see Appendix B, Tables B.2 and B.3). The region of biodiesel levels between B5 and B10 is currently untested, although staff has begun test programs to provide more information.

The complex mechanisms creating NOx increases at different biodiesel levels are not completely understood. The NOx emissions appear to be affected primarily through thermodynamic interactions, yet other factors have also been proposed. For example, Bunce et. al.[13] looked at engine factors such as air to fuel ratio, EGR fraction, rail pressure and start of injection, as well as cetane number, soot radiation, bulk modulus, Engine Control Module feedback, and adiabatic flame temperature as factors that could serve to control engine NOx emissions. The complex interactions created by the fuel and engine system demonstrate the need for continued testing to create a robust dataset.

e. ARB Emissions Testing Program

In order to better understand emissions from biodiesel, ARB contracted with UC Riverside to conduct emissions testing, as well as performing in house emissions testing (Mitigation Study)[14]. Table 6.2 below summarizes the test matrix that was covered by the Mitigation Study.

[13] Bunce et al, *Stock and Optimized Performance and Emissions with 5% and 20% Soy Biodiesel Blends in a Modern Common Rail Turbo-Diesel Engine,* Energy Fuels, 2010, 24 (2), pp 928-939

[14] U.C. Riverside, *CARB Assessment of the Emissions from the Use of Biodiesel as a Motor Vehicle Fuel in California, "Biodiesel Characterization and NOx Mitigation Study",* October 2011

Table 6.2: Summary of Testing Done by ARB and UC Riverside

Application	Engine	Feedstocks	Test Cycles
On-road chassis	Caterpillar C15 Cummins ISM DDC MBE4000 Cummins ISX	Animal Soy Renewable diesel GTL	UDDS FTP 40mph Cruise 50mph Cruise
On-road HD engine	Cummins ISM DDC MBE4000	Animal Soy	UDDS FTP
Non-road engine	John Deere 4084 Kubota TRU	Animal Soy	ISO 8178-4

This study found that most of the emissions from biodiesel are reduced from the CARB diesel baseline, including PM, CO, HC, and most toxic species. However, NOx was found to increase at certain biodiesel blend levels. The results of this study apply specifically to heavy-duty vehicles that do not use post-exhaust NOx emissions control, therefore the results of this study should not be extended to NTDEs or Light-duty and Medium-duty vehicles. More detail on the specific findings of this study is available in the environmental impacts chapter.

ARB staff will continue to analyze available data and conduct additional testing if the information would change conclusions. Staff will return to the Board with any necessary revisions.

f. Biodiesel in New Technology and Light Duty Diesel Engines

Engines that meet the latest emission standards through the use of Selective Catalytic Reduction (SCR) have been shown to have no significant difference in NOx emissions based on the fuel used. A study conducted by the NREL looked at two Cummins ISL engines that were equipped with SCR, and found that NOx emissions control eliminates fuel effects on NOx, even for B100 and even in fuels compared against a CARB diesel baseline.[15]

Light-duty and medium-duty vehicles have similarly been found not to experience increases in NOx due to the use of biodiesel. For example, a study performed on three

[15] Lammert et al, *Effect of B20 and Low Aromatic Diesel on transit Bus NOx emissions Over Driving Cycles with a Range of Kinetic Intensity*, SAE Int. J Fuels Lubr., 5(3):2012

light-duty vehicles using different biodiesel blends found no significant and consistent pattern in NOx emissions based on blend levels across the different engines, blends and cycles[16].

g. NOx Mitigation Options

As a result of the Mitigation Study completed by UC Riverside and ARB, several technically feasible mitigation options were identified that would ensure no NOx increase as a result of biodiesel use. The mitigation options that were identified reduce NOx to parity with conventional CARB diesel by: using additives, altering the baseline fuel, or by undergoing a certification program designed to allow innovate new strategies.

The Mitigation study found that a blend of 1 percent di-tert butyl peroxide in B20 yielded NOx emissions that were equivalent to the CARB diesel baseline. Additionally the Mitigation Study found that a blend of 55 percent renewable diesel, 25 percent CARB diesel and 20 percent biodiesel was equivalent to the CARB diesel baseline. Additionally, 2-ethylhexyl nitrate (2-EHN) was tested to determine whether it would also be able to mitigate the NOx from biodiesel blends since it is also a cetane improver. However the fuels containing 2-EHN had essentially the same NOx emissions as those without additives. The difference between the NOx emissions of these blends compared to baseline CARB diesel is shown in the Table 6.3 below.

Table 6.3: NOx Emissions of Mitigation Measures

Fuel Blend	NOx Diff % from CARB diesel	p-value
B20 1%DTBP	0.0 %	0.959
C25 R55 B20	-0.8 %	0.029
B20 1% 2-EHN	6.3 %	0.000

Taking the mixture of renewable diesel and CARB diesel that successfully mitigated NOx from B20, staff determined specifications of a fuel termed "Low-NOx diesel" that would be capable of mitigating the increase in NOx from a blend of biodiesel up to B20 if mixed in a ratio of at least 4 gallons Low-NOx diesel to 1 gallon biodiesel. The B20 test fuel consisted of 55 percent renewable diesel fuel, 25 percent California diesel fuel, and 20 percent biodiesel; so the hydrocarbon portion was 68.75 percent renewable diesel and 31.25 percent California diesel, by volume, or 67.28 percent renewable diesel and 32.72 percent California diesel, by weight. The properties were estimated by linear interpolation between the measured properties of the renewable and CARB diesel fuels. The cetane number of the Low-NOx diesel is to be determined as natural cetane number, since some cetane improvers were not shown to have a mitigating effect on biodiesel NOx emissions. Table 6.4 shows the calculation of the properties of this Low-NOx diesel. Each property listed for renewable diesel was multiplied by 0.6728, and added to the property of CA diesel multiplied by 0.3272.

[16] Nikanjam et al, *Performance and Emissions of Diesel and Alternative Diesel Fuels in Modern Light-Duty Vehicles*, SAE 2011-24-0198, 2011

Table 6.4: Derivation of Low NOx Diesel Specifications

Properties	Renewable		CA Diesel		Blend
Factor	0.6728 x		0.3272 x		
Aromatic HC Content (% by wt.)	0.4	+	18.7	=	(≤) 6.4
PAH Content (% by wt.)	0.1	+	1.5	=	(≤) 0.6
Specific Gravity (60 °F/60 °F)	0.774	+	0.828	=	0.791
API Gravity	51.3	+	39.3	=	(≥) 47.4
Cetane Number	72.3	+	55.8	=	(≥) 67

In addition to these two options for mitigation, staff is including certification procedures to allow for innovation and to allow the market to determine the best option for mitigation while ensuring no increase in NOx from the use of biodiesel. The certification option is based on the CARB diesel certification procedures under title 13 CCR section 2282(g). The certification requires a minimum of 20 tests each on a CARB diesel reference fuel and a candidate fuel. This number of replicates ensures that any emissions differences between the candidate fuel and the reference diesel are detected if they exist.

h. Effective Biodiesel Blend Level

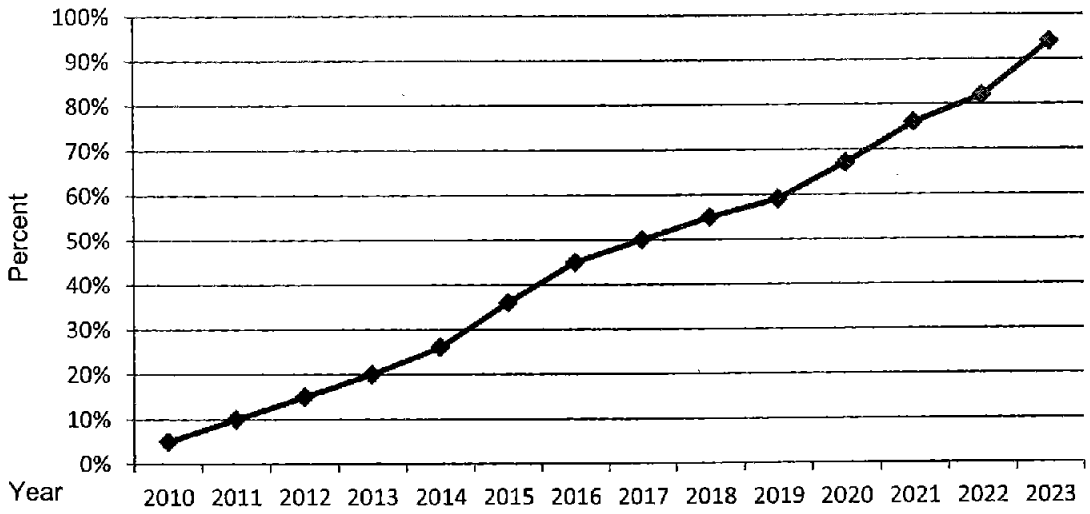
Staff has identified multiple strategies that are capable of reducing the NOx increase from biodiesel, and many of these strategies may exist in the California market prior to triggering of mitigation for biodiesel. In order to account for the use of these mitigating strategies staff has developed the concept of an effective biodiesel blend level, that is, the blend level of biodiesel statewide that would result in the same NOx emissions as the combination of the actual blend level of biodiesel statewide taking into account any NOx mitigating strategies currently in use. Staff has identified four essential parameters that are used when calculating an effective biodiesel blend level: net biodiesel volume, Low-NOx diesel, renewable diesel and animal biodiesel.

Net biodiesel volume is total biodiesel volume, excluding that portion of the total biodiesel volume used in fuel blends at B5 or less. Diesel fuels containing B5 or less (i.e., CARB diesel) are not subject to this regulation. Low-NOx diesel offsets increases in NOx from biodiesel with a decrease in NOx. Renewable diesel is also known to offset NOx emissions. Animal biodiesel tends to emit about half as much NOx as soy biodiesel or other biodiesel feedstocks. When these mitigation strategies are taken together, staff has found that as long as the effective blend level is below 10 percent of the total compression ignition fuels volume in the State there are no excess NOx emissions occurring compared to a CARB diesel baseline.

Figure 6.3 below shows the anticipated portion of the California heavy-duty diesel fleet that is expected to be NTDEs from 2010-2023. The data are from EMFAC2011[17]. Any NOx emissions that would occur from biodiesel use will be reduced proportionally with the portion of the fleet that is NTDE, for example in 2023 the fleet is projected to consist of 94 percent NTDEs and as such excess biodiesel NOx emissions would not occur in that portion of the fleet.

[17] California Air Resources Board, EMFAC2011 Emissions Database, 2011, http://www.arb.ca.gov/EMFAC/

Figure 6.3: Portion of Fleet that is NTDE



*EMFAC2011.

Staff also conducted an analysis to determine if there is any potential for NOx increases based solely on projections of biodiesel usage and renewable diesel usage. For example, could NOx increase due to the use of individual gallons of biodiesel that are B10 or above that are used in non-NTDE vehicles? NOx increases from biodiesel blends B10 or above are completely offset by the consumption of at least 1.375 gallons of renewable diesel for each gallon of biodiesel consumed. Additionally, it is relatively easy to separate out the gallons of biodiesel that are used as B5, and these gallons of biodiesel have been found to have no impact on NOx emissions. Using these factors and staff's projections of total biodiesel use, biodiesel used as less than B5 and total renewable diesel use, staff developed Figure 6.4. As the graph shows, as long as the ratio of biodiesel not used as B5 to renewable diesel is above the 1.375 threshold indicated by the dashed line, there would be no expected increase in NOx. Note that this is a conservative analysis as the analysis does not account for mitigating factors other than renewable diesel. Staff intends to monitor this ratio as time goes by in order to ensure that no local impacts are experienced.

Figure 6.4: Renewable Diesel to Biodiesel Ratio Forecast

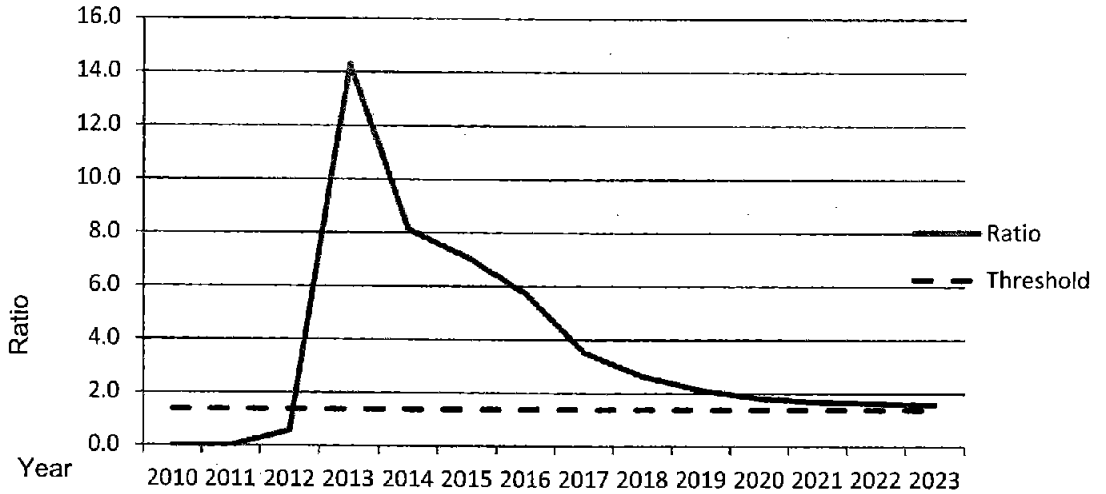
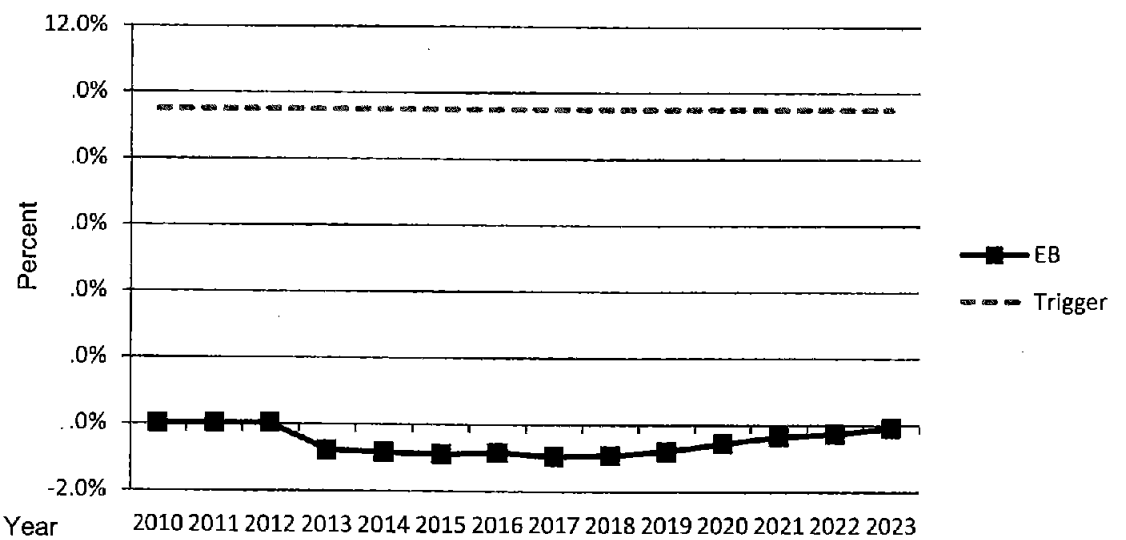


Figure 6.5 below, is a graph that shows the projected effective biodiesel blend level from 2010-2023 along with the mitigation trigger of 95 percent of B10 Statewide. As this graph shows, staff projects that the effective blend level will not reach the mitigation trigger, and as such no statewide NOx emission increases from biodiesel are projected to occur.

Figure 6.5: Effective Biodiesel Blend Level Forecast



i. Engine Performance

Generally, heavy-duty diesel engine manufacturers in the United States approve the use of B5 in their engines. Under consensus standards, the biodiesel component must meet ASTM D 6751, the petroleum diesel component must meet ASTM D975.

According to the Coordinating Research Council report, "A variety of other fuel issues are occasionally of interest with respect to in-use handling and performance of biodistillates." One example is surface tension, which can affect spray atomization, droplet size, and other functions of fuel injection. Although the surface tension of biodiesel is somewhat higher than that of typical No. 2 diesel fuel, this does not seem to be an important determinant in causing noticeable performance effects. Much more important is fuel viscosity, which generally correlates with surface tension, and is responsible for numerous effects as described above."

Although the viscosity of biodiesel is much lower than that of its triglyceride feedstock, it is typically higher than that of petroleum diesel – often by a factor of two. Viscosity can have significant effects on the injection quality of distillate fuels. In general, higher viscosity leads to poorer fuel injection and atomization. Biodiesel users have very few options to improve the viscosity of the fuel. The only practical approaches involve heating the fuel or diluting it with petroleum diesel (or renewable diesel). Low concentration blends of biodiesel (B20 and below) generally have acceptable viscosity, and do not cause significant field problems.

Fuel economy of biodiesel is another in-use operational issue, since biodiesel typically has 10 percent lower mass energy content than No. 2 diesel fuel (expressed as BTU/lb, or kJ/kg). However, due to its somewhat higher fuel density, the fuel economy of biodiesel expressed on a volumetric basis (i.e., miles/gallon) is only lower than that of conventional diesel by a few percent. In actual use, B20 is unlikely to result in any noticeable decrease of volumetric fuel efficiency.

Another in-use operational issue with biodiesel is its effect on injection timing. Fuel is injected into a diesel engine as a consequence of a pressure wave that propagates from the fuel pump (or common rail reservoir) to the injector nozzle. The speed of this propagation is influenced by a fuel property called the bulk modulus of elasticity, which is determined by the fuel density and the speed of sound through the fuel. (Bulk modulus is the product of fuel density and the square of the sound velocity.) Compared to conventional diesel, biodiesel has slightly higher density and sound velocity. Consequently, the pressure wave propagation is slightly faster in B100, resulting in injection timing that is advanced by 1-2°. The consequences of this slight timing change on engine performance and emissions are unclear, with conflicting reports appearing in the literature. However, it is likely that with low concentration blends (B20 and below), any injection timing effects would be too small to be noticeable."

In the U.S., lubricity specifications apply to both conventional diesel and B6-B20 blends of biodiesel. B100 does not have a lubricity specification. In fact, the natural lubricity of neat B100 is so high that a 1-2 percent blend of it with ULSD is generally sufficient to meet the lubricity specification of ASTM D975. In part, biodiesel's good lubricity can be attributed to the ester group within the FAME molecules, but a higher degree of lubricity is due to trace impurities in the biodiesel. In particular, free fatty acids and monoglycerides are highly effective lubricants. It has been noted that purification of biodiesel by means of distillation reduces its lubricity because these high-lubricity impurities are removed. The effect of unsaturation upon lubricity is unclear, with some

researchers reporting positive effects of carbon-carbon double bonds while others report no effect.

j. Storage and Dispensing

Due to its different physical and chemical properties, introducing biodiesel into systems designed for petroleum diesel raises questions about materials compatibility and other potentially adverse impacts on fuel or engine systems. Materials compatibility pertains to the impacts of biodiesel upon seals, gaskets, hoses, metal surfaces, and other materials that the fuels contact. It is well known from laboratory studies and in-use experience that changes in fuel composition can affect the integrity of elastomeric materials.[18] In particular, changes in swelling, shrinkage, embrittlement, and tensile strength are of concern, as extreme changes in these properties can lead to seal failures, leaks, and subsequent problems. Materials compatibility issues are of greatest concern with use of B100. Limiting biodiesel blends to B20 and below, and ensuring that only on-spec fuel is used, greatly reduces these concerns.
The current ASTM D 975, *Standard Specification for Diesel Fuel Oils*, is applicable to diesel fuel oil containing up to 5 percent by volume biodiesel fuel, but the biodiesel fuel must meet the requirements of ASTM D 6751, *Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels.*[19, 20] Underwriters Laboratories Inc. (UL) has announced that products intended to use biodiesel blends up to B5 that are compliant with applicable ASTM International fuel standards will not require special investigation by UL.[21] The SWRCB regards UL's decision as a compatibility determination for the storage of biodiesel blends up to B5 in USTs approved for petroleum diesel. However, leak detection functionality testing with biodiesel blends B6 to B100 is not yet complete. Such testing is necessary for USTs that rely on liquid sensors, automatic tank gauges, and line leak detection systems for methods of leak detection.[22] The SWRCB has adopted an emergency regulation, effective June 1, 2009, which provides a variance from the applicable certification requirements for the storage of biodiesel blends up to B20 in USTs until a determination by the applicable certification organization can be made, but for no longer than 36 months.[23]

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[18] National Renewable Energy Lab, *Impact of Biodiesel Fuels on Air Quality and Human Health: Task 2 Report The Impact of Biodiesel Fuels on Ozone Concentrations*, May 2003

[19] ASTM, 2009. *Standard Specification for Diesel Fuel Oils*, D 975, ASTM International, West Conshohocken, Pennsylvania

[20] ASTM, 2009. *Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels*, D 6751, ASTM International, West Conshohocken, Pennsylvania

[21] Underwriters Laboratories Inc., *Underwriters Laboratories Announces Position on Use of B5 Biodiesel Blends*," http://www.ul.com/global/eng/pages/offerings/industries/appliancesandhvac/gasoilsolidfuel/release, 2009 (accessed September 17, 2013)

[22] California State Water Resources Control Board, *Biodiesel Update: UL Position on B5,* Letter to Local Implementing Agencies and Interested Parties from J. G. Giannopoulos, Chief, Groundwater Quality Branch, Division of Water Quality, January 9, 2009

[23] State of California Office of Administration Law, *Notice of Approval of Emergency Action, In re: State Water Resources Control Board*, OAL File No. 2009-0521-02 E, June 1, 2009

C. Summary of Findings

Overall ARB Staff find that the proposed regulation can be achieved using current technology, which may be improved as future technological innovations evolve.

CHAPTER 7. ENVIRONMENTAL IMPACTS

A. Introduction

This chapter provides an environmental analysis of the proposed regulation. Based on ARB's review, staff has determined that adoption of the proposed ADF regulation would not result in any potentially significant adverse impacts on the environment. This analysis provides the basis for reaching this conclusion. This section of the staff report also discusses environmental benefits expected from implementing the proposed regulation.

B. Environmental Review Process

ARB is the lead agency for the proposed regulation and has prepared this environmental analysis pursuant to its regulatory program certified by the Secretary of the Natural Resources Agency (14 CCR 15251(d); 17 CCR 60000-60008). In accordance with Public Resources Code section 21080.5 of the California Environmental Quality Act (CEQA), public agencies with certified regulatory programs are exempt from certain CEQA requirements, including but not limited to preparing environmental impact reports, negative declarations, and initial studies (14 CCR15250). ARB has prepared this environmental analysis (EA) to assess the potential for significant adverse and beneficial environmental impacts associated with the proposed regulation, as required by ARB's certified regulatory program (17 CCR 60005(b)). The resource areas from the CEQA Guidelines Environmental Checklist were used as a framework for assessing the potential for significant impacts (17 CCR 60005(b)).

If comments received during the public review period raise significant environmental issues, staff will summarize and respond to the comments in the Final Statement of Reasons (FSOR) prepared for the regulation. The written responses to environmental comments will be approved prior to taking final action on the proposed regulation (17 CCR 60007(a)). 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 (17 CCR 60007(b)).

C. Proposed Regulation

1. Description

The ADF regulation establishes comprehensive multi-stage requirements governing the commercialization of future alternative diesel fuels in California. The proposed regulation establishes fuel quality specifications for both Low-NOx diesel fuel and biodiesel. The purpose of the regulation is to ensure the quality of the fuels introduced in the California market has no significant adverse impacts on public health or environment. The proposed regulation is described in more detail in Chapter 5, *Description of Proposed Regulation.*

2. Method of Compliance

The proposed ADF regulation applies to all producers, importers, and distributors of ADFs in the State of California. To introduce an ADF to California fuel market, a producer, importer, or distributors of an ADF must complete the requirements specified in three stages of evaluations required by the regulation as briefly described below:

1) Stage 1 (*Pilot Program)* requirements involve an initial screening process based on an application to determine whether there will be unreasonable potential impacts on air quality, the environment, and vehicular performance. An ADF fuel applicant must submit a Stage 1 application outlined in Section 2293.5, including any additional information required. An MOU will be issued upon the completion of the initial screening process. The MOU will specify terms and conditions that must be met for the duration of the MOU, including: fuel quality information, operational parameters, a volume sales cap and reporting requirements.

2) Stage 2 (*Development of Fuel Specification)* requires additional information that must be submitted by the ADF fuel proponent. Additional data, such as emissions and vehicle performance testing must be developed to better characterize potential impacts to the environment. A multimedia evaluation must be conducted by an ADF fuel proponent to determine whether the ADF has an associated significance threshold for any criteria, toxic, or other air pollutant. Key components of the evaluation process are the identification and evaluation of any significant adverse impacts on public health or the environment and the use of best available scientific data. A multimedia process is further discussed in Chapter 8. Upon submittal of a completed application, an approved Stage 2 MOU will be issued if approved. The Stage 2 MOU will specify terms and conditions that must be met for the duration of the MOU. An interim fuel specification will be required and the conditions will be designed to safeguard against adverse environmental impacts caused by complying with Stage 2 requirements. During this stage, the ADF proponent would be required to conduct a multimedia evaluation including the identification of a "significance threshold" for the ADF based on the evaluation.

3) Stage 3:

    a. 3A (*Commercial Sales Subject to Mitigation)* status will be granted to those ADFs with a significance threshold level established as a result of the multimedia evaluation process. The significance threshold level will be monitored through reporting and recordkeeping requirements required of the ADF fuel applicant. Identified mitigation measure(s) from Stage 2 will be put in place if and when the identified significance threshold level is reached.

    b. 3B (*Commercial Sales Subject to No Mitigation)* status will be granted to those ADFs that are proven to have no environmental impacts. No

mitigation measure or sales restrictions are required for those ADFs. These ADF fuel providers must comply with reporting and recordkeeping requirements only.

D. Environmental Impacts

Staff determined that adoption of the proposed ADF regulation would not result in any potentially significant adverse impacts on the environment, and the proposed ADF regulation may result in environmental benefits.

1. Beneficial Impacts

The proposed regulation provides a market pathway for emerging innovative drop-in substitute alternative diesel fuels such as biodiesel, renewable diesel, gas-to-liquid (GTL) diesel and other synthetic diesels in California. As stated earlier, the proposed regulation is intended to ensure the introduction and use of these innovative ADFs in California result in no significant adverse impacts to public health or to the environment.

The use of ADFs in the California fuel market that meet the regulation's requirements can lead to benefits in public health and air quality if the ADFs are used in place of diesel fuel. Diesel exhaust, produced when an engine burns diesel fuel, is a complex mixture of thousands of gases and fine particles that contain more than 40 toxic air contaminants. These include many known or suspected cancer-causing substances, such as benzene, arsenic and formaldehyde. It also contains other harmful pollutants, including nitrogen oxides which come from ground level ozone, a criteria pollutant.[24]

Although the proposed ADF regulation addresses all future alternative diesel fuels, the regulation includes biodiesel as the first recognized commercialized alternative diesel fuel. Different ADFs may present varying degrees and areas of beneficial impacts associated with its use. For biodiesel, studies have found environmental benefits associated with biodiesel use as compared to use of conventional diesel fuel. Biodiesel is considered a low carbon fuel and supports GHG emission reductions. Biodiesel emits less CO, PM, HC, and air toxics than conventional diesel. A biodiesel exhaust emission study conducted by U.S. EPA[25] found beneficial impacts associated with biodiesel use. Tailpipe emissions from heavy-duty engines were compiled and analyzed. The data shows that approximately 10 to 20 percent range emission reductions of PM, CO and HC at biodiesel blend of B20 blend and approximately 45 to 65 percent range reductions in neat biodiesel, B100, as compared to federal diesel.

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[24] Office of Environmental Health Hazard Assessment and the American Lung Association, Factsheet, *Health Effects of Diesel Exhaust*

[25] U.S. Environmental Protection Agency, *A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions*, EPA420-P-02-001, October 2002

ARB sponsored study in 2011[26] also supports the PM, CO and HC emission reductions compared to CARB diesel as a base comparison fuel in the engine tested which represents the current fleet. When tested on the FTP cycle, soy-biodiesel blends resulted in emission reductions of up to 58, 4 and 63 percent in PM, CO and HC levels, respectively.

Therefore, to the extent that ADF producers, importers, and distributors of ADFs take advantage of the proposed regulation's legal pathway for commercialization of these fuels in California, and these fuels are used in lieu of conventional diesel, benefits to public health, air quality and GHG emissions would occur.

2. Resource Areas with No Impacts

Compliance with the proposed ADF regulation would not result in any adverse impacts because the proposed regulation does not require any physical change to the existing environment. The proposed regulation requires suppliers of ADFs in the California fuel market to meet set fuel specifications and undergo an evaluation process to commercialize the sale of that fuel in California. The purpose of the evaluation process is to require appropriate mitigation measures as necessary to avoid any adverse impacts to the environment from ADF use in California.

Compliance with the proposed regulation does not involve or result in any adverse physical changes to the existing environment, such as new development, modifications to existing buildings or facilities, or new land designations. ARB staff finds that it is not reasonably foreseeable that there would be any adverse impacts on aesthetics, air quality, agricultural and forestry resources, biological resources, cultural resources, geology and soils, greenhouse gases, hazardous materials, hydrology and water quality, land use planning, mineral resources, noise, population and housing, public services, recreation, or traffic and transportation because the proposed regulation does not require any action by the regulated parties that could affect these resources.

Alternatives or mitigation measures to address significant adverse environmental impacts are not discussed in this chapter because no significant adverse environmental impacts would result from implementation of the regulatory proposal.

[26] UC Riverside, *CARB Assessment of the Emissions from the Use of Biodiesel as a Motor Vehicle Fuel in California, "Biodiesel Characterization and NOx Mitigation Study"*, October 2011

CHAPTER 8. MULTIMEDIA EVALUATION

H&SC section 43830.8 prohibits ARB from adopting any regulation that establishes motor vehicle fuel specifications unless that regulation is subject to a multimedia evaluation and reviewed by the CEPC. Pursuant to Public Resources Code section 71017(b), the CEPC was established as a seven-member body comprised of the Secretary for Environmental Protection; the Chairpersons of the ARB and SWRCB; and the Directors of the Office of Environmental Health Hazard Assessment (OEHHA), the Department of Toxic Substances Control (DTSC), the Department of Pesticide Regulation (DPR), and the Department of Resources Recycling and Recovery (CalRecycle). Key components of the evaluation process are the identification and evaluation of significant adverse impacts on public health or the environment and the use of best available scientific data.

A. General Overview

"Multimedia evaluation" means the identification and evaluation of any significant adverse impact in public health or the environment, including air, water, and soil, that may result from the production, use, and disposal of a motor vehicle fuel that may be used to meet the state board's motor vehicle fuel specifications (H&SC §43830.8(b)).

1. Multimedia Working Group

The California Environmental Protection Agency (Cal/EPA) formed the interagency MMWG to oversee the multimedia evaluation process. The MMWG includes representatives from the ARB, SWRCB, OEHHA, and DTSC. The MMWG also consults with other Cal/EPA agencies and experts as needed.

During a multimedia evaluation, ARB staff are responsible for the air quality impact assessment and overall coordination of the MMWG. SWRCB staff are responsible for the evaluation of surface water and groundwater quality and potential impacts. OEHHA staff are responsible for evaluating potential public health impacts. DTSC staff are responsible for evaluating potential hazardous waste and soil impacts.

2. California Environmental Policy Council

Before ARB adopts a regulation that establishes new fuel specifications, the CEPC must determine if the proposed fuel specification poses a significant adverse impact on public health or the environment. In making its determination, the CEPC must consider the following:

- emissions of air pollutants, including ozone-forming compounds, particulate matter, toxic air contaminants, and greenhouse gases,
- contamination of surface water, groundwater, and soil,
- disposal of waste materials, including agricultural residue, forest biomass, and municipal solid waste, and

- MMWG staff report and peer review comments.

The CEPC must complete its review of the evaluation within 90 calendar days following notice from ARB that it intends to adopt the regulation. If the CPEC determines that the proposed regulation will cause a significant adverse impact on public health or the environment, or that alternatives exist that would be less adverse, the CEPC shall recommend alternative measures to reduce the impact.

3. External Scientific Peer Review

H&SC section 43830.8(d) requires an external scientific peer review to be conducted on the multimedia evaluation in accordance with H&SC section 57004. The purpose of the peer review is to determine whether the scientific portions of the staff report are based upon "sound scientific knowledge, methods, and practices (HSC section 57004(d)(2))."

B. Summary of the Biodiesel and Renewable Diesel Multimedia Evaluation

As part of the ADF regulation, staff intends to establish fuel quality specifications for biodiesel and renewable diesel fuel. Therefore, a multimedia evaluation of biodiesel and renewable diesel fuel was conducted pursuant to H&SC section 43830.8 and the *Guidance Document and Recommendations on the Types of Scientific Information Submitted by Applicants for California Fuels Environmental Multimedia Evaluations,* ("Multimedia Evaluation Guidance Document").[27]

The MMWG prepared two staff reports entitled, "*Draft Staff Report: Multimedia Evaluation of Biodiesel*" (Biodiesel Staff Report) and "*Draft Staff Report: Multimedia Evaluation of Renewable Diesel*" (Renewable Diesel Staff Report). The draft staff reports consist of the MMWG's assessment of the biodiesel and renewable diesel multimedia evaluations conducted by the UC Berkeley and UC Davis, and the MMWG's analysis of potential significant adverse impacts on public health and the environment.

The MMWG's conclusions and recommendations are based on the results of the multimedia evaluation and the information provided in the UC final reports entitled, "*California Biodiesel Multimedia Evaluation Final Tier III Report*" (Biodiesel Final Report)[28] and "*California Renewable Diesel Multimedia Evaluation Final Tier III Report*" (Renewable Diesel Final Report).[29]

1. Biodiesel Multimedia Evaluation

[27] U.C. Berkeley, U.C. Davis, Lawrence Livermore National Laboratory, *Guidance Document and Recommendations on the Types of Scientific Information Submitted by Applicants for California Fuels Environmental Multimedia Evaluations*, June 2008

[28] U.C. Berkeley, U.C. Davis, *California Biodiesel Multimedia Evaluation Final Tier III Report*, May 2013

[29] U.C. Berkeley, U.C. Davis, *California Renewable Diesel Multimedia Evaluation Final Tier III Report*, April 2012

The MMWG completed their assessment of the biodiesel multimedia evaluation and potential impacts on public health and the environment. The evaluation is a relative comparison between biodiesel and CARB diesel.

The MMWG concludes that the use of biodiesel fuel in California, as specified in the biodiesel multimedia evaluation, does not pose a significant adverse impact on public health or the environment relative to CARB diesel.

Each agency's individual assessments and conclusions are summarized below:

- *Air Emissions Evaluation.* ARB staff assessed potential air quality impacts and made conclusions based on their assessment of various emissions test results and air quality data, including criteria pollutants, toxic air contaminants, and greenhouse gas emissions data. ARB staff concludes that biodiesel reduces PM, CO, and HC emissions and may increase NOx emissions for biodiesel blends greater than B10, especially for biodiesel produced from soy feedstocks. Biodiesel blends produced from animal tallow feedstocks resulted in about half the NOx increase as biodiesel made from soy feedstocks. Based on the biodiesel NOx impact results from exhaust emissions testing, staff determined the significance threshold for biodiesel is B10.

- *Water Evaluation.* SWRCB staff assessed potential surface water and groundwater impacts and made conclusions based on their assessment of potential water impacts and materials compatibility, functionality, and fate and transport information. SWRCB staff concludes that there are minimal additional risks to beneficial uses of California waters posed by biodiesel than that posed by CARB diesel.

- *Public Health Evaluation.* OEHHA staff assessed potential public health impacts and made conclusions based on their assessment of potential impacts on atmospheric carbon dioxide and combustion emissions results. OEHHA staff concludes that the substitution of biodiesel for CARB diesel reduces the rate of addition of carbon dioxide to the atmosphere and reduces the amount of PM, benzene, ethyl benzene, and polycyclic aromatic hydrocarbons (PAHs) released into the atmosphere, but may increase emissions of NOx for certain blends. Limited emission testing resulted in a non-statistical increase in acrolein for a higher B50 biodiesel blend level (i.e., confidence interval less than 95%). Furthermore, the statistical analysis for acrolein emission results were compared to only one data point for the control sample.

- *Soil and Hazardous Waste Evaluation.* DTSC staff assessed soil and hazardous waste impacts and made conclusions based on their evaluation of hazardous waste generation and potential impacts on the fate and transport of biodiesel fuel in the subsurface soil from unauthorized spills or releases. DTSC concludes that biodiesel aerobically biodegrades more readily than CARB diesel, has potentially

higher aquatic toxicity for a small subset of tested species, and generally has no significant difference in vadose zone infiltration rates.

2. Renewable Diesel Multimedia Evaluation

The MMWG completed their assessment of the renewable diesel multimedia evaluation in support of low NOx standard. The evaluation is a relative comparison between renewable diesel and CARB diesel.

The MMWG concludes that the use of renewable diesel fuel in California, as specified in the renewable diesel multimedia evaluation, does not pose a significant adverse impact on public health or the environment relative to CARB diesel.

Each agency's individual assessments and conclusions are summarized below:

- *Air Emissions Evaluation.* ARB staff assessed potential air quality impacts and made conclusions based on their assessment of various emissions test results and air quality data, including criteria pollutants, toxic air contaminants, and greenhouse gas emissions data. ARB staff concludes that renewable diesel does not pose a significant adverse impact on public health or the environment from potential air quality impacts.

- *Water Evaluation.* SWRCB staff assessed potential surface water and groundwater impacts and made conclusions based on their assessment of potential water impacts and materials compatibility, functionality, and fate and transport information. SWRCB staff concludes that there are minimal additional risks to beneficial uses of California waters posed by renewable diesel than that posed by CARB diesel.

- *Public Health Evaluation.* OEHHA staff assessed potential public health impacts and made conclusions based on their analysis of toxicity testing data and combustion emissions results. OEHHA staff concludes that PM, benzene, ethyl benzene, and toluene in combustion emissions from diesel engines using hydrotreated vegetable oil renewable diesel are significantly lower than CARB diesel.

- *Soil and Hazardous Waste Evaluation.* DTSC staff assessed soil and hazardous waste impacts and made conclusions based on their evaluation of hazardous waste generation and potential impacts on the fate and transport of biodiesel fuel in the subsurface soil from unauthorized spills or releases. DTSC concludes that renewable diesel is free of ester compounds and has low aromatic content. The chemical compositions of renewable diesel are almost identical to that of CARB diesel. Therefore, the impacts on human health and the environment in case of a spill to soil, groundwater, and surface waters would be expected to be similar to those of CARB diesel.

CHAPTER 9. ENVIRONMENTAL JUSTICE AND LOCAL COMMUNITIES

Government Code section 65040.12(e) 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. ARB is committed to supporting the achievement of environmental justice. In 2001, the Board adopted a framework for incorporating environmental justice into the ARB's programs consistent with the directives of State law[30]. Although ARB's environmental justice policies apply to all communities in California, they recognize that environmental justice issues have been raised more often in the context of low-income and minority communities.

As a result of ARB's work with the public, the business sector, local government, and air districts, California's ambient air is the cleanest since air quality measurements have been recorded[31]. Whereas the Los Angeles area experienced 148 smog alerts in 1970, by the year 2000, there was not a single smog alert[32]. However, large numbers of Californians live in areas that continue to experience episodes of unhealthy concentrations of ozone and PM2.5.

For this analysis, we note as an initial matter that any community in proximity to operations involving diesel fueled vehicles is already experiencing incremental risks from exposure to diesel particulate matter (PM). In 1998, ARB identified diesel PM as a toxic air contaminant with no safe threshold of exposure, which means that any diesel PM exposure may increase lifetime cancer risk for affected communities. Consequently, ARB embarked on a comprehensive diesel risk reduction program in the early 2000s, implementing a number of stationary, mobile, and portable diesel engine standards; fleet emission controls; and diesel fuel requirements designed to address such risks.

The proposed rulemaking was designed to maintain the air quality protections already in place under ARB's existing diesel fuel regulations. This includes, but is not limited to, maintaining protections in the only two areas nationwide whose air quality nonattainment status has been classified as "extreme," namely the San Joaquin Valley Air Basin and the South Coast Air Basin. Both areas have strong environmental justice groups that have lobbied ARB to take aggressive action in pursuit of reduced toxic emission releases and attainment of ambient standards to ease air quality-related health burdens on their communities.

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[30] California Air Resources Board, Report, *Policies and Actions for Environmental Justice*, 2001

[31] California Air Resources Board, *History of Air Resources Board*, Website, http://www.arb.ca.gov/knowzone/history.htm, November 16, 20120 (accessed October 4, 2013)

[32] California Air Resources Board, Video file, *Clearing California Skies Updated*, http://www.arb.ca.gov/videos/clskies.htm (accessed October 4, 2013)

The air quality impacts of this regulatory proposal promote environmental justice by maintaining current protections for California's air quality in areas that are simultaneously the most adversely affected with respect to ground level ozone and home to many minority and low-income groups. At the same time, the proposed rulemaking provides a clear legal pathway to the commercialization of innovative, lower carbon diesel fuel substitutes. These innovative substitutes will reduce GHG emissions, and many of them also provide benefits in the form of additional reductions in PM, CO, NOx, toxic air contaminants, and other air pollutants.

As noted in Chapter 6, ADFs have the potential to reduce exposure to pollutants when used as a replacement for conventional diesel. To the extent that the proposed regulation expedites the introduction of ADFs as replacements for conventional diesel, all communities will benefit from improved air quality. In general, staff anticipates that any impacts resulting from the proposed regulation will be beneficial in nature, as a result of introducing new, lower-emitting ADFs.

To further ensure maintenance of air quality protections at the community level, the proposed regulation contains provisions that require a new ADF proponent to disclose comprehensive information about the ADF and the proponent's plan for limited fleet testing of that fuel. This comprehensive and detailed level of information required to be submitted before testing begins will permit ARB staff to assess the potential impacts such vehicle fleet studies could have on the most sensitive communities. Pertinent to the sensitive communities is a provision in the proposal that requires disclosure, in the Stage 1 and Stage 2 phases, of the ZIP codes in which the applicant proposes to conduct the limited vehicle fleet testing. The ARB staff will consider the proposed ZIP codes, along with the feasibility of conducting the fleet tests in alternative locations, as part of the Stage 1 and Stage 2 approval process. Depending on a number of factors, including the nature of the candidate ADFs and the extent of the fleet test, ARB staff may suggest or require a different location for the study as appropriate and feasible.

Based on staff's assessment of current and future ADFs, such as biodiesel and dimethyl ether, it is likely that new ADFs will exhibit less PM emissions relative to conventional diesel. In such cases, communities will benefit from lower cancer risk associated with the replacement of diesel fuel with ADFs. Likewise, communities will also benefit from any reductions in other criteria and toxic air pollutants associated with ADF use. The State mandated multimedia assessment will determine whether future ADFs will exhibit any increases in other toxic compounds, which may warrant additional controls. Moreover, since the proposed regulation provides for a more orderly process than currently exists towards commercialization, ARB would have more oversight over the approval of any ADF use in local communities and can ascertain whether additional requirements should apply to safeguard against any adverse impacts.

In addition to governing the approval and use of future ADFs, the proposed regulation would also explicitly identify biodiesel as the first ADF commercialized under this regulation. Biodiesel has an extensive history of environmental evaluation and consensus standard development. Indeed, much of the proposed regulation is modeled

on ARB staff's experience in evaluating biodiesel over the years. As a result, the proposed regulation would explicitly identify biodiesel as a Stage 3A ADF, "*Commercial Sales Subject to Mitigation*," in recognition of the fact that biodiesel already has effectively undergone the requirements in Stage 1 and 2.

As discussed in Chapter 6 and the multimedia evaluation, biodiesel has been shown to reduce PM, HC, CO and greenhouse gases from diesel engines. Therefore, replacing diesel with biodiesel provides an immediate reduction in toxic cancer risk that is proportional to the percent reduction in PM emissions. Likewise, reductions in HC and CO also help communities by lowering near source and regional concentrations of ozone and CO.

Being the first commercially recognized ADF under the proposed regulation, biodiesel will have positive air quality impacts and benefits for all communities. In Chapter 6, we projected no need for NOx-mitigation measures to be applied to higher biodiesel blends because of ongoing mitigation effects already occurring in the diesel substitute fuels and heavy duty diesel engine markets. In the unlikely event that the effective biodiesel blend level closely approaches the B10 level, the structure and provisions of the proposed regulation will ensure that NOx emissions are maintained within the levels achieved by our current diesel fuels regulations. Moreover, section 211(v) of the Clean Air Act requires U.S. EPA to mitigate any adverse effects that may occur from the increasing volumes of biodiesel and other biofuels mandated under the RFS2 program to the greatest extent achievable, further assuring that the benefits of our existing diesel fuel regulations will be maintained.[33]

Given the significant price premium for higher biodiesel blends such as B20 or B100, it is highly unlikely that operators of heavy-duty, legacy diesel fleets would opt to use the more expensive, higher biodiesel blends when comparable, lower cost conventional CARB diesel or B5 blends are readily available. Moreover, some original equipment manufacturers do not provide warranty coverage for engines operating on either B20 or B100 (or intermediate blends), or they have not provided the same assurances of compatibility with their engines as they have with B5. Therefore, it is unlikely that fleet operators of legacy diesel vehicles would opt to incur an additional potential risk or cost

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[33] As part of its recent RFS2 rulemaking in 2011, EPA analyzed the projected increase in VOC, CO, PM, NOx, and other pollutants from biodiesel due to the increased volume mandate relative to the base case. EPA concluded that a 0.43 billion gallon national increase in biodiesel use would have minimal impacts, as follows:

> "Given the small emissions impact of a 0.43 bill gal increase in biodiesel on the total U.S. emissions inventory (the basis for our air quality modeling scenarios), we would expect the portion of air quality impacts attributable to a move from 1.0 to 1.28 bill gal (a 0.28 bill gal biodiesel increase) to be small enough that on a nationwide basis the air quality impact would likely not be noticeable."
>
> We note that Clean Air Act section 211(v) requires EPA to analyze and mitigate, to the greatest extent achievable, adverse air quality impacts of the renewable fuels required by the RFS2 rule. We intend to address any potential adverse impacts from increased renewable fuel use through that study and will promulgate appropriate mitigation measures separate from today's NPRM." [emphasis added.] [Table IV.C.4-1 at 76 FR 38870.]

with using the higher biodiesel blends since such engines have not been recommended for use with the higher biodiesel blends.

In conclusion, the proposed ADF regulation is designed to ensure that the introduction and use of new innovative ADFs in California, including biodiesel, will have no significant adverse environmental or public health impacts. This conclusion applies at the State level as a whole, at the various air basin and regional levels, and at the local community level. As a result, the proposed regulation maintains the environmental and human health protections that are already provided under the existing diesel fuel regulations.

CHAPTER 10. ECONOMIC IMPACTS ASSESSMENT

ARB staff has evaluated the potential economic impacts associated with the proposed ADF regulation. For the reasons described in the analysis below, staff concludes that the proposed regulation will have only minimal economic costs to ADF producers and no cost to consumers, government agencies and private businesses.

A. Summary of the Economic Impacts

In preparing this economic analysis, staff considered the costs of complying with the general provisions prescribed for Stage 1, Stage 2, and Stage 3 (as described in Chapter 5), as well as the cost for biodiesel suppliers to comply with the regulation, since biodiesel will be the first commercialized ADF to be regulated under this proposal.

Since the full cost of the proposed regulation will be borne upon successful completion of all stages, and the vast majority of the provisions in those stages are already required under other existing State and federal programs, staff estimates that the overall cost of the regulation to commercialize a future ADF will be minimal at about $1600 annually for an ADF producer to account for additional or "enhanced" recordkeeping. We did not estimate potential mitigation costs for a generic ADF because mitigation measures, to the extent they are required and applied, are highly specific to each individual ADF. No potential ADF we are aware of, except for biodiesel, has undergone more than a preliminary analysis akin to Stage 1 of this proposal.

As noted elsewhere in this report, biodiesel has already undergone the equivalent of the proposal's Stages 1 and 2, and the proposal identifies a significance threshold for biodiesel. Accordingly, it will be sold in the California market under Stage 3A upon this proposed regulation becoming effective. Although we have identified a significance threshold and mitigation measures to be applied in the unlikely event the threshold is nearly reached, we do not project the biodiesel market will reach that threshold. We, therefore, project minimal costs for biodiesel compliance with the identified mitigation measures. The proposal provides for enhanced recordkeeping for biodiesel, which we estimated to be an additional $1,600 annually for each biodiesel producer, for a total cost of $35,200 for all 22 biodiesel producers currently supplying California. Thus, the overall cost of the regulation is estimated to be $35,200, which represents the cost of biodiesel compliance. We anticipate similar ADFs that are approved for commercialization under this regulation would incur similar compliance costs if a significance threshold is identified. For ADFs with no significance thresholds identified, there will be no costs attributable to the proposed regulation because those ADFs would be subject to the same reporting requirements as all other commercial motor vehicle fuels.

The proposed regulation is not expected to have a significant adverse economic impact on California businesses or their competitiveness. Furthermore, because future ADFs

are expected to be price competitive with CARB diesel, we anticipate no significant adverse fiscal impacts on consumers or any local and State agencies.

B. 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 businesses to compete with businesses in other states.

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

Finally, H&SC section 57005 requires the ARB to perform an economic impact analysis of submitted alternatives to a proposed regulation before adopting any major regulation. A major regulation is defined as a regulation that will have a potential cost to California business enterprises in an amount exceeding ten million dollars in any single year. While the cost of the proposed regulation is not expected to exceed ten million dollars, staff has prepared an analysis of alternatives for completeness.

C. Methodology for Estimating Costs

The full cost of complying with the proposed regulation will depend on whether a new ADF achieves full commercial development and successfully completes all three stages. Full commercialization of new ADFs in California will depend on successful resolution to myriad technical issues including, but not limited to, vehicle performance, fuel infrastructure compatibility, public health and environmental issues. However, if a new ADF successfully completes all of the three prescribed stages, then only minimal recordkeeping and reporting costs will ultimately be attributable to the proposed regulation. In general, most of the proposed regulation requirements are already required under other State and federal mandates.

The only actual cost of implementing the regulation will be the cost to recognize biodiesel as the first commercial ADF. However, given the fact that biodiesel currently has consensus standards, is completing a multimedia assessment, and has identified both a NOx significance threshold and mitigation options, staff proposes to recognize biodiesel as a Stage 3A commercial ADF subject to mitigation under specified conditions. Since future biodiesel sales in California are not anticipated to reach the significance threshold (as described in Chapter 5) for triggering mitigation measures, regulatory costs for biodiesel only focus on the need for enhanced recordkeeping by ADF producers. In addition, staff also presents the estimated cost of implementing the mitigation measures for general information purposes.

1. Costs Attributable to Other State and Federal Mandates

A main objective of the proposed ADF regulation is to consolidate existing requirements, supplemented with minor additional data requirements and enhanced recordkeeping provisions, to provide a clear, legal pathway to commercialization for new ADFs. As noted, many of the proposed regulatory requirements already exist in various State and federal programs.

Table 10.1: Applicable Requirements from Various State and Federal Mandates

	Proposed Regulation	FTC[1] Labeling	DMS Fuels[2] Authority	DMS Fuel[3] Variance	H&S Code 43830.8[4]	USEPA[5] Registration
Test Program Application	x			x		
- Test Plan (vehicle ID, fuels, duration, etc.)	x			x		
- ADF Commercialization Plan	x					
- Fuel Chemical Properties	x			x		
- USEPA Registration	x					x
- Reporting & Recordkeeping	x	x	x	x		
Consensus Fuel Specification Development	x			x		
Enforcement of ASTM Stds.			x			
Fuel Quality Testing	x		x	x		
Pump Labeling (biodiesel blends)		x				
Multimedia Evaluation[6]	x				x	
Determination of Significance Level	x				x	
Enhanced Reporting	x					

1. Federal Trade Commission regulation on biodiesel pump labeling under 16 CFR Part 306.
2. CA Dept. of Food & Ag.-Div. of Measurement Stds. authority to enforce ASTM fuel quality stds. under title 4 CCR sec 4140, 4148, 4200, 4202-4205.
3. CDFA-DMS administration of developmental fuel variance program under title 4 CCR sec 4144, 4147-4148.
4. Multimedia evaluation requirements under Health & Safety Code sec 43830.8.
5. USEPA fuels and additives registration program under 40CFR Part 79.
6. Also requires lifecycle analysis, release scenarios & emissions testing.

Table 10.1 shows the existing applicable mandates, which require the same information required under the proposed regulation. However, under the proposed regulation, information generally would be required early in the phase in process and before the ADF is commercialized in California to allow for screening of environmental and public health impacts. For purposes of this cost analysis, staff did not consider the costs of meeting the existing applicable mandates that overlap with the requirements under the proposal.

For example, H&SC 43830.8 currently requires a multimedia evaluation to be conducted for any fuel before the ARB can establish motor vehicle fuel specifications for any

particular fuel. Thus, while a multimedia evaluation is required under Stage 2 of the proposed regulation, the cost of that evaluation is not attributable to this rulemaking.

Another set of State mandates affecting the enforcement of potential ADFs pertains to regulatory requirements promulgated by the California Department of Food and Agriculture, Division of Measurement Standards (DMS). Under Title 4, California Code of Regulations (CCR), Sections 4140-4149 and 4200-4205, DMS has the responsibility to enforce the consensus (ASTM) standards for the fuels listed therein, including biodiesel. Therefore, costs for meeting the ASTM standards or developing consensus standards for future ADFs are attributable to the DMS regulations.

The DMS also administers a program that is similar to the proposed Stage 1 requirements. Known as the developmental fuel variance (DFV), this program is authorized under Title 4 CCR, Sections 4144, 4147 and 4148. The DFV program allows unconventional motor vehicle fuels to be used in limited quantities to develop data in support of the development of consensus standards for those fuels. Stage 1 of the proposed regulation requires the same information as that required under the DFV, but the proposal also requires additional information. Thus, staff's analysis for the proposal does not consider the portion of the costs that would already be incurred under the DFV program.

A couple of federal programs also apply to ADFs that would be subject to the proposal. First, U.S. EPA requires a supplier of gasoline or diesel fuel or an additive to be registered with them under 40 CFR 79 prior to the sale, offer for sale, or supply for use of such fuel products in California. Similarly, the proposed regulation would require U.S. EPA registration before an ADF could be sold or supplied in California under Stage 1. Second, the FTC specifies particular labeling requirements on individual pumps that dispense B6-B20 and blends above B20 (no labeling requirements for B5 and below). For enforcement purposes, fuel marketers are required to maintain volume sales and other fuel content records for these labeled pumps. The proposed regulation contains recordkeeping, testing, and reporting requirements that would piggyback on these existing federal requirements.

The shaded rows in Table 10.1 represent two new requirements attributable to the proposed regulation, namely an ADF commercialization plan and the need for enhanced reporting for ADFs under Stage 3A. Although the proposed regulation does not require that fuel producers fully commercialize their ADFs, they presumably intend to do so at the successful conclusion of the proposal's phased in testing program, so we have included a provision that requires submittal of such commercialization plans to enhance our own ADF market monitoring and enforcement planning.

In commercializing its ADF, a fuel producer would likely follow normal business practices by developing a detailed business plan that establishes major milestones and timelines. The proposal simply requires that ADF producers submit such business plans to the ARB.

Alternative diesel fuels that meet the criterion for a Stage 3A (Commercial ADFs subject to Mitigation) will be required to conduct enhanced recordkeeping to monitor progress towards meeting any significance threshold. The level of enhanced recordkeeping will be a case by case determination since ADFs employ different chemistries relative to one another. Therefore, the cost attributable to this regulation will solely consist of enhanced recordkeeping costs; we are basing our estimates on such costs with the costs associated with biodiesel as a Stage 3A commercial ADF.

2. Regulatory Cost of Biodiesel as an Alternative Diesel Fuel

As discussed in Chapter 5, biodiesel would the first alternative diesel fuel subject to the proposed regulation. As shown below, only nominal costs will apply in the foreseeable future since biodiesel and biodiesel blends are already subject to consensus standards under ASTM D6751 and ASTM D7467. Likewise, the ARB sponsored a multimedia assessment which is near completion. Information from the multimedia assessment resulted in the identification of a NOx significance threshold.

This places biodiesel in Stage 3A, and therefore only the cost of Stage 3A compliance would be attributable to the proposed regulation. This means that the cost of biodiesel as the first commercial ADF will be primarily the cost of enhanced monitoring. As staff discussed in Chapter 6, additional mitigation is highly unlikely. In the remote possibly that the significance threshold trigger level is reached in the future, the cost of NOx mitigation would also be attributable to the proposed regulation. Mitigation costs are presented below for informational purposes.

a. Current Biodiesel Market

Biodiesel has been a commonly traded commodity for several years throughout the United States and California. Biodiesel is selling today at a premium compared to diesel sold throughout the West Coast[34]. However, when used as a blendstock, some biodiesel blends can be competitive in price to diesel sold in California. As shown in Table 10.2, biodiesel blends are priced similarly to CARB diesel and some B20 and B100 blends are more expensive, according to the Oil Pricing Information Service (OPIS). As with any other ADF, biodiesel must presumably remain cost competitive with respect to CARB diesel to provide a viable economic alternative. As discussed below, the overall cost of biodiesel and biodiesel blends will not be significantly impacted by the cost of the proposed regulation.

[34] California Department of Energy, *Clean Cities Alternative Fuel Price Report*, April 2013

Table 10.2: OPIS gross wholesale price for Biodiesel, Biodiesel blends and CARB ULSD (8/29/2013), in price/gal

Region	City	Feedstock*	B100	B20	B05	CARB Diesel
Northern	Oakland	Multi	$4.38	$3.57	$3.45	
	Oakland	Soy	$5.03	$3.72	$3.60	
	Oakland	YG	$4.37	$3.60	$3.46	
	Oakland	Comb	$4.59	$3.65	$3.52	
	Richmond	Multi	$4.83	$3.40	$3.32	
	Richmond	Soy	$5.16	$3.74	$3.60	
	Richmond	YG	$4.71	$3.48	$3.41	
	Richmond	Comb	$4.94	$3.56	$3.46	
	San Francisco	Multi	$4.83	$3.40	$3.32	
	San Francisco	Soy	$5.16	$3.70	$3.61	
	San Francisco	YG	$4.71	$3.48	$3.41	
	San Francisco	Comb	$4.93	$3.54	$3.46	
	San Jose	Multi	$4.87	$3.61	$3.49	
	San Jose	Soy	$5.20	$3.75	$3.58	
	San Jose	YG	$4.94	$3.67	$3.50	
	San Jose	Comb	$5.04	$3.70	$3.54	
Central CA.	Bakersfield	CARB Diesel/SME				$3.39
Southern CA	Coachella	YG	$4.73			
	Los Angeles	Multi	$4.77			
	Los Angeles	Soy	$5.40			
	Los Angeles	Comb	$5.08			

* SME-Soy methyl ester; YG-Yellow Grease; Multi-Multiple feedstocks; Comb- Combined biodiesel produced from different feedstocks; Mult-Multiple feedstocks for biodiesel production

b. Cost of Enhanced Recordkeeping

Since staff is proposing to allow commercialization of biodiesel under Stage 3A with a significance threshold, staff must monitor the statewide effective biodiesel blend level to determine the rate at which the significance threshold is approached and also to be ready to implement appropriate mitigation strategies well before that significance threshold is reached. To this end, detailed market sales and related information would be required from biodiesel producers.

The primary costs involved will be the cost of recording and reporting essential information, including but not limited to: monthly biodiesel sales volumes by blend (B5, B10, B20, B100); geographic location of biodiesel marketers along with their specific blend sales; fleet-specific information (which fleets are using what blends, are

such fleets using new technology diesel engines, etc.); volume of renewable diesel and other low-NOx fuel sales by geographic location; and, sales of biodiesel produced from animal tallow feedstocks.

As shown in Table 10.3, staff estimates that a typical cost for enhanced recordkeeping for each producer will be about $1,600 annually. For the 22 producers we are aware of, we estimate the total cost for recordkeeping to be $35,200 per year.

Table 10.3: Estimate of Annual Cost of Enhanced Recordkeeping*

Number of Producers	Annual Recordkeeping Hrs. per Producer	Cost/Hr**	Annual Cost/Producer	Total Annual Cost for all Producers
22	40	$40.00	$1,600	$35,200

* Enhanced monitoring consists of: monthly biodiesel sales volumes by blend (B5, B10, B20, B100); geographic location of respective biodiesel blend sales; fleet information from downstream distributors; volume of renewable diesel and other Low-Nox fuel sales by geographic location; Sales of biodiesel produced from animal tallow feedstocks

** Prevailing wage for environmental engineer (source: http://www.bls.gov/ooh/architecture-and-engineering/environmental-engineers.htm)

b. Cost of NOx Mitigation if Significance Level is Reached

Despite the very low likelihood of reaching the NOx significance threshold, staff estimated the cost of complying with the NOx mitigation measures. A detailed analysis of the cost of mitigation can be found in Appendix C and is summarized in Table 10.4. However, based on the analysis presented in Chapter 6, staff concludes that mitigation is highly unlikely to be needed and therefore, not included in the overall cost of the proposed regulation.

Table 10.4: Cost of Mitigating Biodiesel NOx Emissions

Mitigation Option	Cost per Biodiesel Gallon	Total Cost/Formulation
NOx Additives	$0.25/gal	
ADF Certification		$100,000-$200,000
Low NOx Diesel	$1.20/gal	

Expressed in 2013 dollars.

c. Total Cost of Biodiesel Under Proposed Regulation

Based on the estimates above, we expect the total cost of biodiesel as the first commercial ADF regulation to reflect primarily the cost of enhanced monitoring at $1,600 per year per producer, or $35,200 total cost per year for all producers. Upon implementation of the ADF regulation in 2015, the annual biodiesel production is projected to be 120 million gallons (see Appendix B, Table B1) for an incremental biodiesel cost of less than $0.001 per gallon.

D. Economic Impacts Analysis on California Businesses

Generally speaking, the ADF market consists of those that produce, distribute and sell to end users. In California, biodiesel serves as a good model for future ADFs in that the production and use of an ADF will generally require an integrated distribution system.

Table 10.5 lists several businesses that support biodiesel use in California, including 22 biodiesel producers and 22 biodiesel distributor/blenders operating in the State. Thirty-three of these are small businesses, based on the North American Industry Classification System's (NAICS) definition for small businesses. The list of producers and distributors was derived from Dun & Bradstreet and the NBB's lists of biodiesel producers[35] and distributors[36]. We expect that since the regulatory costs are predominately borne by ADF producers and those costs are low, there will be no little or minimal fiscal impacts to distributors, retailers, or end users. This includes the over 70 retail stations throughout California that sell biodiesel and biodiesel blends.

Table 10.5: List of Biodiesel Producers and Distributors in California

Biodiesel Producers	Small Business	NAICS
Accu Chem Conversion, Inc	unknown	424690
American Biodiesel, Inc.	yes	424720
Baker Commodities, Inc.	no	311613
Bay Biodiesel, LLC	yes	325199
Biodiesel Industries of Ventura, LLC	yes	333243
Biota Corporation	yes	115112
Crimson Renewable Energy, L.P.	yes	325110
Eco Energy Biodiesel, A California Corporation	yes	999990
Energy Alternative Solutions, Incorporated	no	324110
Footprint Recycling	yes	424720
Geogreen Biofuels, Inc.	yes	424720
Imperial Western Products, Inc., A California Corporation	yes	424590
New Leaf Biofuel, LLC	no	324110
Noil Energy Group, Inc.	yes	484121
North Star Biofuels, LLC	unknown	325110
Promethean Biofuels Cooperative Corporation	yes	311613
R Power Biofuels LLC	yes	325998
Simple Fuels Biodiesel	yes	454310
Sky Blue Bio-Fuels Inc	yes	325110
Socal Biofuel, Inc.	yes	325199
Wright Biofuels	yes	325414
Yokayo Biofuels	yes	445120

[35] National Biodiesel Board, *Biodiesel Plants Listing*, http://www.biodiesel.org/production/plants/plants-listing (accessed September 17, 2013)

[36] National Biodiesel Board, *Biodiesel Distributor Listings*, http://www.biodiesel.org/using-biodiesel/finding-biodiesel/locate-distributors-in-the-us/biodiesel-distributor-listings (accessed September 17, 2013)

Biodiesel Distributors		
Downs Energy	yes	447190
Eel River Fuels, Inc.	yes	424720
General Petroleum Corporation	no	424720
Goodspeed Auto-Fuel Systems, Inc.	no	454310
Inter-State Oil Co.	no	424720
Interstate Oil Company	yes	447190
NAPA Valley Petroleum, Inc.	no	424720
People's Fuel Cooperative	yes	325110
Propel Fuels	unknown	325110
Ramos Oil Company Inc.	yes	424720
Royal Petroleum Company	yes	424720
RTC Fuels, LLC	yes	445110
Southern Counties Oil Co.	yes	424710
Supreme Oil Co.	yes	454310
Tom Lopes Distributing, Inc.	yes	424720
W. H. Breshears, Inc.	yes	424710
Waterbrook Community Church	yes	813110
Lee Escher Oil Co	yes	424720
New West Petroleum	yes	424720
Pearson Fuels	yes	454319
Sirona Fuels	no	324110
SC Fuels	yes	424720

Since biodiesel will be the first ADF subject to this proposal, staff's analysis focused on the expected impacts to the biodiesel industry and primarily to biodiesel producers. Because we estimated the total cost impacts for the 22 biodiesel producers in aggregate are about $35,200 annually, primarily in monitoring and recordkeeping costs. Based on the approximate 30 million gallons of biodiesel sold in California each year, we anticipate these minimal costs would not represent a significant adverse economic impact to businesses, even if these costs are passed along per gallon to businesses and consumers that purchase biodiesel blends.

E. Potential Economic Impacts to Consumers

As noted, we expect individual consumers would incur minimal or no costs as a result of the proposed regulation. Fuel suppliers already blend up to five volume percent biodiesel by volume in CARB diesel that is offered throughout the state. Higher blends of biodiesel are currently sold at a price premium relative to CARB diesel, but such premiums exist in the absence of the proposed regulation. Therefore, the proposal should not adversely affect retail prices for biodiesel blends based on the anticipated minimal costs discussed above.

F. Impacts to California State or Local Agencies

Several State agencies operate large fleets, often with many alternative fuel vehicles included in their fleet. According to the California Department of General Services (DGS) report, "2012 Progress Report for Reducing or Displacing Consumption of Petroleum Products by the State Fleet," the State's government fleet is using increasing amounts of alternative fuels, including biodiesel. However, as is the case with individual consumers and businesses that purchase biodiesel, we expect this regulation to have no significant cost impacts on purchasers of biodiesel fuel, including the State, due to the minimal costs of compliance for the biodiesel producers.

Staff also contacted municipalities that are well known for their use and promotion of biodiesel use. These cities included San Francisco, Los Angeles, Santa Monica, San Jose, San Diego, and Berkeley. Anecdotal evidence suggests most biodiesel sold in the State is sold near the production plants that are close to these municipalities. We are unaware of smaller municipalities in the Central Valley or mountainous regions of the State that are using biodiesel in significant quantities. Accordingly, the staff's analysis focused on economic impacts to local agencies within the aforementioned areas. As shown in Table 10.2, we found that B5 and B20 are generally cost competitive with conventional CARB diesel, and based on the minimal compliance costs for the producers; we do not expect local agencies that purchase biodiesel for their fleets to be significantly affected by the proposed regulation.

G. Analysis of Cost Effectiveness on Cost per Gallon

Cost effectiveness is typically defined as the dollars spent to reduce a unit mass of a specified pollutant. Because the proposal is designed to maintain current environmental protections rather than achieve additional air pollution reductions, the concept of cost-effectiveness does not apply to the proposal. Nevertheless, upon implementation of the proposed ADF regulation in 2015, the regulatory costs of compliance (up to the low tens of thousands of dollars per year), if passed on to the consumer, would yield a per-gallon impact that is small (e.g., $35,200 per year / 120 million gallons per year = $0.0003 per gallon increase).

H. Analysis of Alternatives

During the development of this regulation, staff considered alternatives to the proposal. We determined that the proposal represents the least-burdensome approach that best achieves the objectives at the least cost. Specifically for biodiesel, we considered two alternatives to the proposal: business as usual (i.e., no proposed regulation), and requiring implementation of the mitigation measures for all biodiesel blends above B10 immediately without the proposed phase in process.

Regarding the business-as-usual alternative, we deemed this option as infeasible because it would leave in place the ad-hoc approach and separate regulatory and administrative procedures ARB staff currently uses when developing a motor vehicle fuel specification. By contrast, the proposal encourages the development and

commercialization of innovative, lower-carbon alternative diesel fuels by providing a single unified and comprehensive set of clear rules that ADF producers and importers would need to follow. This, in turn, would provide certainty to investors and producers of alternative diesel fuels.

We deemed the second alternative as infeasible because its costs would be substantially greater than the proposal and would not achieve more benefits. Indeed, this option has the potential to disrupt or even collapse the burgeoning ADF market by unnecessarily placing overly restrictive requirements that are not warranted by emissions testing. For example, ARB's testing program identified not only a significance threshold for biodiesel but also a number of factors that have the effect of reducing or eliminating the impacts on NOx emissions from higher blend levels of biodiesel (e.g., the use of new technology diesel engines, increasing use of renewable diesel and low-NOx diesel, the use of low-NOx additives). Immediately requiring NOx mitigation for any blend above B10 without the phase-in process set forth in the proposal would effectively ignore the aggregate benefits of these mitigating factors. By contrast, the proposal recognizes that mitigation, and its concomitant costs, may not even be needed for biodiesel if, for example, the trajectories for NTDE fleet penetration and use of renewable diesel proceed as we have projected. However, if mitigation was required for blends above B10 in 2015 (date of regulation implementation), the anticipated cost is about $3 to $14 million. This accounts for a mitigation cost of $0.25/gal to $1.20/gal for a biodiesel volume of 12 million gallons (10 percent of total biodiesel volume as shown in Table B.1)

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CHAPTER 11. SUMMARY AND RATIONALE

The Proposed ADF regulation is designed to allow a streamlined path to commercialization for new diesel substitutes, while ensuring no increase in air pollution from those fuels. This section discusses the requirements and rationale for each provision of the proposed regulation.

Subarticle 2. Commercialization of New Alternative Diesel Fuels

Section 2293 Purpose

Summary of section 2293
Section 2293 states the purpose of this regulation is to establish a comprehensive, multi-stage process governing the commercialization of new alternative diesel fuels (ADF) in California, ranging from the initial limited sales of an ADF, while it undergoes a screening evaluation, through expanded sales governed by enhanced monitoring, testing, and multimedia evaluations; and ending with full-scale commercial sales as warranted.

Rationale for section 2293
This section is needed to inform the regulated public and other market participants of this regulation's intent to foster the introduction and use of innovative ADFs in California, while ensuring no significant adverse impacts overall on public health or the environment, relative to conventional petroleum-based CARB diesel.

Section 2293.1 Applicability

Summary of section 2293.1(a)
Subsection(a) establishes January 1, 2015, as the effective date of this regulation, as well lays out general requirements that must be met in order to legally sell, or supply alternative diesel fuels (ADFs) in California.

Rationale for section 2293.1(a)
This section is needed to establish the implementation date, after which ADF sales will need to be either under an MOU with CARB, or meeting applicable requirements of the regulation, to considered legal motor vehicle fuels in California.

Summary of section 2293.1(b)
Subsection(b) explicitly states specific actions that would constitute the intent of using an ADF for use in motor vehicles.

Rationale for section 2293.1(b)
This subsection provides clarity in defining when an ADF is intended to be used as a motor vehicle fuel for purposes of this regulation.

Summary of section 2293.1(b)(1)
Subsection (b)(1) states that ADFs stored at a facilities equipped and used to dispense ADFs into motor vehicles, will be considered to be intended for motor vehicle use.

Rationale for section 2293.1(b)(1)
This subsection establishes one of the criteria that would define intent to use an ADF as a motor vehicle fuel, thus subject to this regulation.

Summary of section 2293.1(b)(2)
Subsection (b)(2) states that ADFs delivered or intended for delivery to a facility equipped and used to dispense said ADFs into motor vehicles, as intended for motor vehicle use.

Rationale for section 2293.1(b)(2)
This subsection establishes one of the criteria that would define intent to use an ADF as a motor vehicle fuel, thus subject to this regulation.

Summary of section 2293.1(b)(3)
Subsection (b)(3) states that any ADF sold or supplied to a person engaged in the distribution of motor vehicle fuels to motor vehicle fueling facilities, is considered an ADF for motor vehicle use, unless said person takes reasonable prudent precautions to ensure the ADF is not used for motor vehicles.

Rationale for section 2293.1(b)(3)
This subsection establishes one of the criteria that would define intent to use an ADF as a motor vehicle fuel, thus subject to this regulation.

Summary of section 2293.1(c)
Subsection (c) states that each retail sale or supply of an ADF into a motor vehicle, shall be considered as such in the event this fuel is sold in violation of this article.

Rationale for section 2293.1(c)
This section is needed to establish the chain of strict liability for ADF sales. In other words, the ADF supplier or seller is not free of the responsibility for their part in the chain of custody for the ADF.

Section 2293.2 Definitions

Summary of section 2293.2 and subsections (a) through (ee)
This section proposes definitions to the terms used in the regulation.

Rationale for section 2293.2
It is necessary that ARB defines its terms as they apply to the Alternative Diesel Fuels regulation. Several of these terms are used in the same manner as other articles and titles in the California Code of Regulations, Government Code sections or statutes. It is necessary for ARB to be consistent with existing definitions to the extent that they apply to this regulation.

Section 2293.3 Exemptions

Summary of section 2293.3
Section 2293.3 introduces the list of exemptions that apply to this proposed regulation.

Rationale for section 2293.3
This section provides a general statement which introduces a list of exemptions applicable to this regulation.

Summary of section 2293.3(a)
The subsection clarifies that alternative diesel fuels with specifications under sections 2292-2297.7 of Sub article 1 are not subject to this regulation.

Rationale for section 2293.3(a)
Subsection (a) is needed to clarify that non ADFs with existing specifications are exempt from this regulation. Alternatively, ADFs without current specifications are subject to regulation.

Summary of section 2293.3(b)
Subsection (b) explains that CARB diesel additives are not considered ADFs when blended at less than 1 percent with CARB diesel.

Rationale for section 2293.3(b)
This section is needed to clarify that CARB diesel additives are not subject to this regulation when blended at less than 1 volume percent with CARB diesel, even if the additive is an ADF blended with 99 percent conventional CARB diesel. Likewise, this section clarifies that the proposed mitigation options requiring the use of additives are not subject to this requirement.

Summary of section 2293.3(c)
This section stipulates that ADFs intended to be used in fleets comprised of 95 percent or more new technology diesel engines are exempt from this regulation, provided they do not contribute to greater emissions of known pollutants relative to CARB diesel. The section also specifies that the ARB Executive Officer, may factor the volumes of ADFs used in NTDEs when determining if the significance threshold is being reached.

Rationale for section 2293.3(c)
The section provides an exemption to account for the fact that NTDEs equipped with mechanical devices can mitigate NOx emissions from biodiesel use, the only commercial ADF currently recognized by the regulation. As new ADFs emerge, this subsection allows the ARB Executive Officer to restrict volumes of the new ADF while determining if NTDEs also mitigate any pollutants of concern in future ADFs. The section also specifies that the ARB Executive Officer consider the ADF volumes being used in NTDEs when determining if the significance threshold is being reached for any particular ADF and also to determine the extent mitigation is required.

Summary of section 2293.3(d)
Subsection (d) explains that CARB diesel (under title 13 CCR section 2281, et. seq.) may contain up to 5 volume percent biodiesel and is exempt from this regulation. The section also stipulates that the ARB Executive Officer may factor the ADF volumes being used to make CARB diesel (and its emission reduction potential) when determining if the significance threshold is being reached for any particular ADF.

Rationale for section 2293.3(d)
The subsection is necessary to acknowledge that CARB diesel, which may contain less than 5 volume percent biodiesel, has not been shown to increase NOx emissions in the technical literature and therefore is not subject to the regulation. The section also specifies that the ARB Executive Officer may factor the volume of ADF being blended with conventional CARB diesel when determining any significance thresholds or the extent that mitigation would be required.

Section 2293.4 General Requirements Applicable to All ADFs

Summary of section 2293.4(a)
Subsection (a) states that an ADF must be registered with the U.S. EPA under 40 CFR part 79 prior to sale or supply for use in California.

Rationale for section 2293.4(a)
This section is necessary to ensure that future ADFs undergo the comprehensive federal registration program as a screening step to preclude any potential adverse public health impacts associated with ADF use before they are introduced into California. Future ADFs are already subject to the U.S. EPA registration program, thus inclusion of this requirement reaffirms the legal requirement for proposective ADF producers.

Summary of section 2293.4(b)
Subsection (b) states that effective January 1, 2015, no person shall sell or supply for use in California, and ADF, that does not meet all applicable California Department of Food and Agriculture (CDFA) regulatory requirements.

Rationale for section 2293.4(b)
Subsection (b) is necessary to reaffirm that ADF producers would be subject to current CDFA legal requirements and that these regulations are not superseded by this proposed regulation.

Summary of section 2293.4(c)
Subsection (c) states that upon implementation of the proposed regulation, no person shall sell or supply for use in California any ADF that does not meet all other applicable local, State, and Federal requirements.

Rationale for section 2293.4(c)
Subsection (c) is necessary for consistency to reaffirm that current local, State, and Federal requirements for ADFs remain in effect and will also require compliance.

Section 2293.5 Phase-In Requirements

Summary of section 2293.5
Section 2293.5 states that ADFs intended for use in motor vehicles that do not meet the requirements of this regulation by having a fuel specification or approved MOU in place cannot be sold without being in violation of this regulation.

Rationale for section 2293.5
This section is necessary to introduce the different stages of the regulation and the MOU requirements in Stage 1.

Summary of section 2293.5(a)
Subsection (a) explains the purpose of Stage 1 of the regulation.

Rationale for section 2293.5(a)
Subsection (a) is needed to provide context for the subsequent subsections regarding the Stage 1 requirements.

Summary of section 2293.5(a)(1)
Subsection (a)(1) states that ADFs subject to this regulation, may not be sold or supplied in California after the effective date of the regulation, unless the ADF producer enters into a MOU with CARB, or if the ADF fuel is already in subsequent stage of the regulation. The section also contains the lead sentence for a list of requirements to obtain an MOU, in subsections 2293.5(a)(1)(A) through 2293.5(a)(1)(R).

Rationale for section 2293.5(a)(1)
Subsection (a)(1) is needed to assert that an MOU with CARB is required prior to legal sale or supply for use of ADFs in California, unless said ADF is already in subsequent stage of the regulation.

Summary of section 2293.5(a)(1)(A)
Subsection (a)(1)(A) states that an estimate of expected program duration must be submitted to ARB by the ADF producer when applying for a MOU.

Rationale for section 2293.5(a)(1)(A)
This subsection is needed to request and obtain data to be used by staff for their evaluation and monitoring of candidate ADFs during the Stage 1 pilot program. This information will be included in the MOU and will be used calculate any ADF emissions effects over the program duration time period.

Summary of section 2293.5(a)(1)(B)
Subsections (a)(1)(B) states that an estimate of maximum number of vehicles or engines involved in the Stage 1 pilot program must be submitted to ARB by the ADF producer when applying for a MOU.

Rationale for section 2293.5(a)(1)(B)
This subsection is needed to request and obtain data to be used by staff for their evaluation and monitoring of candidate ADFs during the Stage 1 pilot program. This information will be included in the MOU and will allow staff to develop comprehensive understanding of pilot program parameters.

Summary of section 2293.5(a)(1)(C)
Subsections (a)(1)(C) states that the mileage duration per vehicle involved in the Stage 1 pilot program must be submitted to ARB by the ADF producer when applying for a MOU.

Rationale for section 2293.5(a)(1)(C)
This subsection is needed to request and obtain data to be used by staff for their evaluation and monitoring of candidate ADFs during the Stage 1 pilot program. This information will be included in the MOU and will allow staff to replicate any pilot program parameters if needed for future testing as well as facilitate the calculation of ADF emissions on a per mile basis.

Summary of section 2293.5(a)(1)(D)
Subsections (a)(1)(D) states that the quantity of fuel expected to be used in the pilot program must be submitted to ARB by the ADF producer when applying for a MOU. This volume is not to exceed the energy equivalent of one million gallons of diesel fuel per year, per ADF total vehicle involved in the Stage 1 pilot program.

Rationale for section 2293.5(a)(1)(D)
This subsection is needed to request and obtain data to be used by staff for their evaluation and monitoring of candidate ADFs during the Stage 1 pilot program. This section is also needed to limit the volumes of emerging ADF volumes entering commerce, until comprehensive data regarding potential impacts or lack thereof are learned.

Summary of section 2293.5(a)(1)(E)
Subsections (a)(1)(E) states that information about the site(s) in which the testing during the Stage 1 Pilot Program will be conducted (including the street address, city, county, and zip code) must be submitted to ARB by the ADF producer when applying for a MOU.

Rationale for section 2293.5(a)(1)(E)
This subsection is needed to request and obtain data to be used by staff for their evaluation and monitoring of candidate ADFs during the Stage 1 pilot program. This information will be included in the MOU and will be used to evaluate the program site

location for potential conflicts with local or state government policies for any geographic areas in the State.

Summary of section 2293.5(a)(1)(F)
Subsections (a)(1)(F) states that the manner in which the distribution pumps will be labeled to ensure proper use of the test fuel in the pilot program must be submitted to ARB by the ADF producer when applying for a MOU.

Rationale for section 2293.5(a)(1)(F)
This subsection is needed to request and obtain data to be used by staff for their evaluation and monitoring of candidate ADFs during the Stage 1 pilot program. This information will be used to ensure that candidate ADFs are adhering to FTC labeling requirements as well as to assure staff candidate ADFs do not get mixed with other diesel fuels during the testing program.

Summary of section 2293.5(a)(1)(G)
Subsections (a)(1)(G) states that the name, address, telephone number, title of the person(s) and the name of the company or organization requesting entry into a Stage 1 pilot program must be submitted to ARB by the ADF producer when applying for a MOU.

Rationale for section 2293.5(a)(1)(G)
This subsection is needed to establish contact information for the responsible party for dealings with CARB relative to the Stage 1 Pilot program.

Summary of section 2293.5(a)(1)(H)
Subsections (a)(1)(H) states that the name, address, telephone number, title of the person(s) and the name of the company or organization preparing the information needed for an MOU, if different from the information requested in subsection (a)(1)(G), must be submitted to ARB by the ADF producer when applying for a MOU.

Rationale for section 2293.5(a)(1)(H)
This subsection is needed to establish who's the responsible party for the information submitted to CARB as part of the MOU application data requirements, if different from the information submitted as part of subsection (a)(1)(G). These responsible parties may include testing labs, or third parties.

Summary of section 2293.5(a)(1)(I)
Subsections (a)(1)(I) states that the chemical and physical properties of the candidate ADF including complete chemical speciation, Chemical Abstract Services (CAS) numbers (if available), density, energy content, vapor pressure, oxidative potential, distillation curve, log K_{ow} (water-octanol partition coefficient), and Henry's law coefficient must be submitted to ARB by the ADF producer when applying for a MOU.

Rationale for section 2293.5(a)(1)(I)
This subsection is needed to request and obtain data to be used by staff for their evaluation of potential adverse emissions impacts resulting from use of the ADF in Stage 1. Some of this information will be included in the MOU as fuel parameters for the candidate ADF to ensure consistency of the fuel being evaluated in Stage 1.

Summary of section 2293.5(a)(1)(J)
Subsections (a)(1)(J) states that environmental information about the ADF inlcuding Material Safety Data Sheet(s) (MSDS) for all components of the candidate ADF, production process diagram, identification of potential human health effects, lifecycle flow diagram (including all stages of the process-raw material extraction, manufacturing, distribution, use and disposal including all intervening transportation steps), and potential release scenarios during production (including by-products), transportation and use, must be submitted to ARB by the ADF producer when applying for a MOU.

Rationale for section 2293.5(a)(1)(J)
This subsection is needed to request and obtain data to be used by staff for their evaluation and monitoring of potential adverse health impacts resulting from use of the ADF in Stage 1. This section is also needed because ADFs are generally cutting edge products with little data available for them. By requesting the information in subsection (a)(1)(J), staff can develop a comprehensive understanding of the ADF distribution infrastructure.

Summary of section 2293.5(a)(1)(K)
Subsections (a)(1)(K) states that the ADF producer applying for an MOU must identify whether the fuel is intended to be blended with diesel, whether it can be used as a neat fuel, or whether it can be used either way, must be submitted to ARB by the ADF producer when applying for a MOU.

Rationale for section 2293.5(a)(1)(K)
This subsection is needed to request and obtain data to be used by staff for their evaluation and monitoring of the ADF in the pilot program. This section is also needed because ADFs are generally cutting edge products with little data available for them. By requesting the information in subsection (a)(1)(K), staff can evaluate an ADFs feasibility by verifying compatibility with existing conventional CARB Diesel infrastructure.

Summary of section 2293.5(a)(1)(L)
Subsections (a)(1)(L) states that the ADF producer applying for an MOU must identify the plan for commercialization of the ADF under this regulation and submit the information to ARB.

Rationale for section 2293.5(a)(1)(L)
This subsection is needed to request and obtain data to be used by staff for their evaluation and monitoring of the ADF in the pilot program. This section is also needed

because ADFs are generally cutting edge products with little data available for them. The requested information will allow staff to keep pace with emerging industry practices.

Summary of section 2293.5(a)(1)(M)
Subsections (a)(1)(M) states that the ADF producer applying for an MOU must provide the results of emissions testing completed on criteria pollutants and submit the information to ARB.

Rationale for section 2293.5(a)(1)(M)
This subsection is needed to request and obtain emissions testing results of ADFs to be used by staff in their evaluation of the ADF for potential increases of pollutants of concern such as PAH's or TAC's.

Summary of section 2293.5(a)(1)(N)
Subsections (a)(1)(N) states that the ADF producer applying for an MOU must provide attestation that the vehicles to be used in the pilot program are owned by the applicant or the applicant has received written consent from their owners to ARB.

Rationale for section 2293.5(a)(1)(N)
This subsection is needed to ensure ARB is not held responsible for damage to vehicles used as part of the ADF pilot program.

Summary of section 2293.5(a)(1)(O)
Subsections (a)(1)(O) states that the ADF producer applying for an MOU must provide the vehicle identification number (VIN) of each vehicle participating in the pilot program to ARB.

Rationale for section 2293.5(a)(1)(O)
This subsection is needed to ensure ARB staff obtain information that will allow them to verify the vehicle information submitted as part of the application for the MOU is accurate.

Summary of section 2293.5(a)(1)(P)
Subsections (a)(1)(P) states that the ADF producer applying for an MOU must provide an affirmative statement that the owner(s) of all vehicles to be used in the applicant's pilot program are aware of any possible warranty issues that may arise from the use of the candidate ADF or candidate ADF/CARB diesel blend in their engines.

Rationale for section 2293.5(a)(1)(P)
This subsection is needed as a protection for ARB against responsibility for any engine or vehicle damage incurred by using a Stage 1 ADF, under an MOU with CARB.

Summary of section 2293.5(a)(1)(Q)
Subsections (a)(1)(Q) is the lead sentence to a list of subsequent subsections indicating the declarations an ADF producer must make when applying for an MOU.

Rationale for section 2293.5(a)(1)(Q)
This subsection is needed as it introduces a list of requirements under subsections (a)(1)(Q) through (a)(1)(Q)(iii).

Summary of section 2293.5(a)(1)(Q)1.
Subsections (a)(1)(Q)(i.) states that an ADF producer must declare there is an existing fuel standard for the ADF as required by Business and Professions Code Chapter 14, sections 13400 to 13460 when applying for an MOU.

Rationale for section 2293.5(a)(1)(Q)1.
This subsection is needed to assure ADF producers applying for an MOU are adhering to other existing laws governing the use of ADFs.

Summary of section 2293.5(a)(1)(Q)2.
Subsections (a)(1)(Q)(ii.) states that an ADF producer must provide a copy of the developmental fuel variance the applicant has submitted to the California Department of Food and Agriculture pursuant to Business and Professions Code section 13405 and proof of its approval when applying for an MOU, if the information requested in subsection (a)(1)(Q)(i.) is not provided.

Rationale for section 2293.5(a)(1)(Q)2
This subsection is needed to ensure ADF producers applying for an MOU are adhering to existing laws governing the use of ADFs.

Summary of section 2293.5(a)(1)(Q)3
Subsections (a)(1)(Q)(iii.) states that an ADF producer must provide proof that the requirements of Business and Profession Code Section 12001– 13800 other than fuel quality have been met when applying for an MOU.

Rationale for section 2293.5(a)(1)(Q)3
This subsection is needed to ensure ADF producers applying for an MOU are aware of and adhering to existing laws governing the use of ADFs.

Summary of section 2293.5(a)(1)(R)
Subsections (a)(1)(R) states that an ADF producer must provide proof that the candidate ADF has been registered with the U.S. Environmental Protection Agency under 40 CFR 79.

Rationale for section 2293.5(a)(1)(R)
This subsection is needed to ensure ADF producers applying for an MOU are aware of and adhering to existing laws governing the use of ADFs.

Summary of section 2293.5(a)(2)
Subsection (a)(2) is the front part of a sentence that is completed in the subsequent subsections listing the steps in the application process once an MOU application is received by CARB.

Rationale for section 2293.5(a)(2)
This subsection is needed to initiate a chronological list of steps that ARB will take while reviewing an application for an MOU.

Summary of section 2293.5(a)(2)(A)
Subsections (a)(2)(A) states that the CARB executive Officer after receiving a pilot program application, shall advise the applicant in writing within 20 business days either that the application is provisionally complete or that specified additional information is required to make it provisionally complete.

Rationale for section 2293.5(a)(2)(A)
This subsection is needed to inform the ADF provider of the timely fashion in which their application for an MOU will be handled, consistent with ARB policy for application response times.

Summary of section 2293.5(a)(2)(B)
Subsections (a)(2)(B) states that the CARB Executive Officer after receiving the specified additional information required under subsection (A), will inform the applicant in writing within 15 business days either that the application is now provisionally complete or that specified additional information is still required to make it complete.

Rationale for section 2293.5(a)(2)(B)
This subsection is needed to inform the ADF provider of the timely fashion in which their subsequent submittal of information for an MOU will be handled, consistent with ARB policy for application response times.

Summary of section 2293.5(a)(2)(C)
Subsections (a)(2)(C) states that the CARB Executive Officer will deem the MOU application as incomplete if the additional information requested under subsections (A) or (B) are not received within 60 days of the request.

Rationale for section 2293.5(a)(2)(C)
This subsection is needed to inform the ADF provider of the consequences of not providing the additional information requested under subsection (A) or (B).

Summary of section 2293.5(a)(3)
Subsection (a)(3) is front part of a sentence that is completed in subsequent subsections through (a)(3)(D)(4.) that lists the procedure for public comment and final

action on a Stage 1 MOU application.

Rationale for section 2293.5(a)(3)
This subsection is needed to initiate a chronological list of steps that ARB will take on a MOU application that's has been deemed complete, but not yet approved.

Summary of section 2293.5(a)(3)(A)
Subsection (a)(3)(A) states that after deeming an application provisionally complete, the application will be posted on an ARB's web site at for 15 days for public comments related to potential factual or methodological errors. The applicant shall then make revisions to their application or submit a detailed written response to the Executive Officer explaining why no revisions are necessary within 30 days of the application being posted.

Rationale for section 2293.5(a)(3)(A)
This subsection is needed to inform the ADF provider of their obligation to address any factual or methodological errors in their MOU application within 30 days.

Summary of section 2293.5(a)(3)(B)
Subsection (a)(3)(B) states the Executive Officer shall either approve or disapprove the pilot program and notify the applicant of his/her decision in writing within 20 business days of receiving the applicant's response to the public comments under (A). If an application is disapproved, the Executive Officer will inform the applicant of the reasons for their application being disapproved.

Rationale for section 2293.5(a)(3)(B)
This subsection is needed to inform the ADF provider of the timely fashion in which a decision will made whether to approve or disapprove their complete application for an MOU, and their right to know the reasons if disapproved, consistent with ARB policy for application response procedures/protocols.

Summary of section 2293.5(a)(3)(C)
Subsection (a)(3)(C) states the Executive Officer shall disapprove a proposed pilot program if a determination is made that the candidate ADF poses an unacceptable risk to the community in which the pilot program is proposed to be conducted, or its risks substantially outweigh its benefits.

Rationale for section 2293.5(a)(3)(C)
This subsection is needed to provide ARB with the authority to disapprove a pilot program application if neccesary to protect the public health.

Summary of section 2293.5(a)(3)(D)
Subsection (a)(3)(C) states that no approval of a pilot program shall be effective without an approved Memorandum of Understanding between CARB and the applicant(s), with terms and conditions based on information provided pursuant to subsections (1)(A)--(R).

Subsection (a)(3)(C) also contains the front part of a sentence that is completed in the subsequent subsections listing information that will be used to determine the terms and conditions of the MOU.

Rationale for section 2293.5(a)(3)(D)
This subsection is needed to reassert the requirement to have an approved MOU before commencing an ADF pilot program as well as to initiate a the list of additional information that ARB will take into account when determining the Terms and conditions of an approved MOU for a pilot program.

Summary of section 2293.5(a)(3)(D)(1.)
Subsection (a)(3)(D)(1.) states the Executive Officer may request any additional information deemed necessary to fill in data gaps that may have been identified during the application process.

Rationale for section 2293.5(a)(3)(D)(1.)
This subsection is needed because many ADF's are on the cutting edge of motor vehicle fuels and additional information not already required pursuant to subsections (1)(A)--(R), may be needed to develop a pilot program that is comprehensive and protective of the public health.

Summary of section 2293.5(a)(3)(D)(2.)
Subsection (a)(3)(D)(2.) states that the Executive Officer may request additional toxicity testing and other testing if necessary and appropriate to better characterize any substance in the candidate ADF.

Rationale for section 2293.5(a)(3)(D)(2.)
This subsection is needed to provide ARB staff with authority to request follow up tests in the current testing required under subsection (M) does not provide assurances of no adverse emission or health impacts.

Summary of section 2293.5(a)(3)(D)(3.)
Subsection (a)(3)(D)(3.) states that applicants for an MOU must provide evidence of substantial progress in working in good faith with the original equipment/engine manufacturers of the engines involved in the MOU, consensus standards organizations, regulatory agencies, and other interested parties toward developing a consensus set of fuel specifications for the candidate ADF

Rationale for section 2293.5(a)(3)(D)(3.)
This subsection is needed to provide ARB staff assurance that the candidate ADF is being evaluated by agencies other the CARB in areas of their expertise such as motor vehicle engine compatibility, and performance standards.

Summary of section 2293.5(a)(3)(D)(4.)
Subsection (a)(3)(D)(4.) states that applicants for an MOU must use adequate controls to ensure appropriate fuel quality and performance in consideration of vehicle performance, impact on the environment and fuel production.

Rationale for section 2293.5(a)(3)(D)(4.)
This subsection is needed to provide ARB staff assurance that the applicant is taking prudent precautions to ensure the candidate ADF does not create unforeseen adverse impacts on the environment or vehicle performance.

Summary of section 2293.5(a)(4)
Subsection (a)(4) is an introductory sentence to frame how the applicant will operate under a Stage 1 approved MOU.

Rationale for section 2293.5(a)(4)
This subsection is needed to frame the information provided in subsections (a)(4)(A) through (a)(4)(E).

Summary of section 2293.5(a)(4)(A)
Subsection (a)(4(A) is front part of a sentence that is completed in subsequent subsections through (a)(4)(B) through (a)(4)(E) that lists the operating guidelines of a stage 1 pilot program.

Rationale for section 2293.5(a)(4)(A)
This subsection is needed to initiate a list of operating parameters explained in subsequent subsections through (a)(4)(E).

Summary of section 2293.5(a)(4)(B)
Subsection (a)(4(B) states that the Executive Officer may terminate or modify a MOU, with 30 days written notice to the applicant(s), for failure of the applicant(s) to comply with any of the terms and conditions of the MOU, failure to comply with any other applicable provision in this subarticle, or for good cause, which may include unacceptable risks to the community in which the pilot program is being conducted, or risks substantially outweighing the putative benefits of the candidate ADF.

Rationale for section 2293.5(a)(4)(B)
This subsection is needed to provide CARB with the authority to terminate a pilot program if necessary to protect the public health.

Summary of section 2293.5(a)(4)(C)
Subsection (a)(4(C) states that the Executive Officer shall not revoke or modify an approved Stage 1 MOU without first affording the applicant an opportunity for a hearing in accordance with 17 CCR 60040 et seq.

Rationale for section 2293.5(a)(4)(C)
This subsection is needed to inform the applicant of their rights to a hearing before their MOU can be revoked or modified by ARB.

Summary of section 2293.5(a)(4)(D)
Subsection (a)(4(D) informs the applicant that they may request a six month extension, renewable up to three times for their pilot program.

Rationale for section 2293.5(a)(4)(D)
This subsection is needed to inform the applicant of their rights to request up to three, six month extensions if their pilot program is not completed within the time specified under 2293.5(a)(1)(B).

Summary of section 2293.5(a)(4)(E)
Subsection (a)(4(E) states that upon successful completion of the pilot program, the applicant(s) may submit an application for a Stage 2 MOU, as specified in section 2293.5(b).

Rationale for section 2293.5(a)(4)(E)
This subsection is needed to inform the applicant of their rights to request a Stage 2 MOU, upon completing the Stage 1 Pilot Program of their existing MOU.

Summary of section 2293.5(b)
Subsection (b) states the purpose of Stage 2, which is to allow limited but expanded fleet use of an ADF that has successfully undergone the Stage 1 pilot program and the overall requirements of Stage 2 including additional emissions and performance testing, conducted pursuant to a formal multimedia evaluation leading to the development of a fuel specification, as appropriate. Subsection (b) also defines the role of the multimedia evaluation in Stage 2, including its basis for determining whether the candidate ADF has an associated significance threshold for any criteria, toxic, or other air pollutant and how the establishment of a significance threshold will determine whether the candidate ADF can proceed to mitigated sales under Stage 3A or unmitigated sales under Stage 3B.]

Rationale for section 2293.5(b)
Subsection (b) is needed to provide context for the subsequent subsections through 2293.5(d)(3) regarding the Stage 2 requirements.

Summary of section 2293.5(b)(1)
Subsection (b)(1) states that a person who successfully completes a pilot program for a candidate ADF under section 2293.5(a) may apply for entrance into a Stage 2 for said ADF. Subsection (b) also states that the applicant must submit an application to the CARB to enter Stage 2 and provides a lead sentence to be completed in subsections (b)(1)(A) through (b)(1)(G) which list the information required by CARB to deem a Stage 2 application as complete.

Rationale for section 2293.5(b)(1)
This subsection is needed to inform the applicant of the option to increase their allowed ADF commercial volumes under the Stage 1 MOU, by applying for a Stage 2 MOU. This subsection also provides a lead sentence that initiates a list of operating protocols explained in subsequent subsections through (a)(4)(E).

Summary of section 2293.5(b)(1)(A)
Subsection (b)(1)(A) states that an application for a Stage 2 MOU must include an estimate of the planned duration for this stage, not to exceed one year, renewable up to four times or as otherwise provided in section 2293.5(b)(4).

Rationale for section 2293.5(b)(1)(A)
This subsection is needed to inform the applicant of the option to increase the length of duration of Stage 2 for their ADF.

Summary of section 2293.5(b)(1)(B)
Subsection (b)(1)(B) states that an application for a Stage 2 MOU must include an estimate of the maximum number of vehicles or engines involved in this stage along with a description of the emissions control technology.

Rationale for section 2293.5(b)(1)(B)
This subsection is needed to provide the applicant with one of the items needed to evaluate how comprehensive the ADF emissions studies for an ADF in Stage 2 will be, as well as to account for mechanical mitigation used in NTDEs when evaluating emissions characteristics of ADFs.

Summary of section 2293.5(b)(1)(C)
Subsection (b)(1)(C) states that the mileage duration per vehicle involved in Stage 2 must be provided to CARB as part of the Stage MOU application.

Rationale for section 2293.5(b)(1)(C)
This subsection is needed to request data that will be used by staff to evaluate and monitoring of candidate ADFs during Stage 2 of the regulation. This information will be included in the Stage 2 MOU and will allow staff to replicate any multimedia parameters if needed as well facilitate the calculation of ADF emissions on a per mile basis.

Summary of section 2293.5(b)(1)(D)
Subsection (b)(1)(D) states that the quantity of the candidate ADF fuel expected to be used in Stage 2, not to exceed the energy equivalent of 30 million gallons of diesel fuel per year, must be provided to CARB as part of the Stage 2 MOU application.

Rationale for section 2293.5(b)(1)(D)
This section is also needed to limit the volumes of emerging ADF volumes to 30 million gallons, until comprehensive data regarding potential impacts or lack thereof are learned.

Summary of section 2293.5(b)(1)(E)
Subsection (b)(1)(E) states that the site(s) in which the testing during this stage will be conducted (including the street address, city, county, and zip code) must be provided to CARB as part of the Stage 2 application.

Rationale for section 2293.5(b)(1)(E)
This subsection is necessary as this information will be included in the MOU and will be used to evaluate the program site location for potential conflicts with local or State government policies as they pertain to any geographic areas within the State.

Summary of section 2293.5(b)(1)(F)
Subsection (b)(1)(F) states that any changes or updates to the information submitted under 2293.5(a)(1)(F)—(R) to reflect the expanded scope of vehicles, locations, fuel volume, timeframe, and other aspects of operation under Stage 2 must be provided to CARB as part of the Stage 2 application.

Rationale for section 2293.5(b)(1)(F)
This subsection is necessary as this information will be used by staff to assess the progress of the ADF towards full commercialization as well as to account for potential increases in adverse or positive emissions impacts during Stage 2.

Summary of section 2293.5(b)(1)(G)
Subsection (b)(1)(G) states that the applicant must Identify the test lab and principal investigator, including his/her curriculum vitae, who will be conducting the multimedia evaluation for the candidate ADF. This section also informs the applicant of their responsibility to identify and trade secret or confidential information in their application.

Rationale for section 2293.5(b)(1)(G)
This subsection is necessary for staff to determine the credentials and experience of the person(s) conducting the testing that will be used to generate the data for candidate ADFs, which will be used to determine for significance levels for any pollutants of concern and informs applicant of their responsibility to identify confidential information.

Summary of section 2293.5(b)(2)
Subsection (b)(2) is a framing sentence for subsequent subsections (A) and (B) related to the Stage 2 application completeness determination.

Rationale for section 2293.5(b)(2)
This section is necessary to inform the applicant of the following subsections content.

Summary of section 2293.5(b)(2)(A)
Subsection (b)(2)(A) states the Executive Officer shall advise the applicant in writing within 20 business days either that the application is complete or that additional information is required to make it complete.

Rationale for section 2293.5(b)(2)(A)
This subsection is necessary to inform the applicant of the time frame within which they can expect A response from CARB, to their initial Stage 2 application submittal.

Summary of section 2293.5(b)(2)(B)
Subsection (b)(2)(B) states that the Executive Officer, after receiving the information requested under subsection(b)(2)(A), will inform the applicant in writing within 15 business days if their application is complete or if additional information is still required.

Rationale for section 2293.5(b)(2)(B)
This subsection is needed to inform the applicant of the time frame within which they can expect a response from CARB, regarding their Stage 2 supplemental information submitted under subsections (b)(2)(A) or (b)(2)(B).

Summary of section 2293.5(b)(3)
Subsection (b)(3) is a framing sentence for subsequent subsections (b)(3)(A) through (b)(3)(D)(1.) relating to the Stage 2 public comments period and final actions on the application.

Rationale for section 2293.5(b)(3)
This section is necessary to inform the applicant of the following subsections content.

Summary of section 2293.5(b)(3)(A)
Subsection (b)(3)(A) states that after deeming an application provisionally complete, the application will be posted on an ARB's web site at for 30 days for public comments related to potential factual or methodological errors or vehicle performance information and that the applicant shall make revisions to their application or submit a response to the Executive Officer explaining why no revisions are necessary within 30 days of the application's posting.

Rationale for section 2293.5(b)(3)(A)
This section is necessary to inform the applicant of the public comment period on their application and of their responsibility to address any comments pertaining to potential factual or methodological errors or vehicle performance that may arise during the comment period.

Summary of section 2293.5(b)(3)(B)
Subsection (b)(3)(B) states that the Executive Officer shall either approve or disapprove the Stage 2 application within 20 business days of receiving the applicant's response to

the public comments and provide the applicant, if the application is denied, the reasons for the denial.

Rationale for section 2293.5(b)(3)(B)
This section is necessary to inform the applicant of time frame for the Executive Officer to reach a decision whether to approve or disapprove the Stage 2 application, and that the reasons for a decision to not approve the application, will be provided to them if that is the decision.

Summary of section 2293.5(b)(3)(C)
Subsection (b)(3)(C) states that the Executive Officer shall disapprove a proposed pilot program if he/she determines the use of the ADF poses an unacceptable risk to the community(ies) in which the program is proposed to be conducted, or its risks substantially outweigh the benefits.

Rationale for section 2293.5(b)(3)(C)
This subsection is needed to provide CARB with the authority to terminate a Stage 2 pilot program if necessary to protect the public health.

Summary of section 2293.5(b)(3)(D)
Subsection (b)(3)(D) states that approval of a Stage 2 program shall be effective only with an approved MOU executed between CARB and the applicant(s) that includes the terms and conditions the applicant must meet in order to provide the ADF fuel in California. The terms and conditions shall be based on the information specified in the Stage 2 MOU application. This subsection also provides an introductory sentence for a list of subsequent requirements in subsections (b)(3)(D)(1.) through (b)(3)(D)(3.).

Rationale for section 2293.5(b)(3)(D)
This subsection is needed to provide clarity that a Stage 2 pilot program is not CARB approved or legal, without an existing MOU between CARB and the applicant in place and to introduce the next three subsections listing additional information requirements of a Stage 2 MOU application.

Summary of section 2293.5(b)(3)(D)(1.)
Subsection (b)(3)(D)(1.) states the Executive Officer may request any additional information deemed necessary to fill in data gaps that may have been identified during the application process.

Rationale for section 2293.5(b)(3)(D)(1.)
This subsection is needed in the event information provided by the applicant pursuant to subsections (1)(A)--(G) results in the need for a closer look at the ADF, which may result in requests for additional information. The section is needed to authorize ARB to request this additional information beyond subsections (1)(A)--(G).

Summary of section 2293.5(b)(3)(D)(2.)
Subsection (b)(3)(D)(2.) states that the Executive Officer may request additional toxicity testing and other testing if necessary and appropriate to better characterize any substance in the candidate ADF.

Rationale for section 2293.5(b)(3)(D)(2.)
This subsection is needed to provide ARB staff with authority to request follow up tests if the testing conducted as part of the Stage 2 program does not provide adequate assurances of no adverse emission or health impacts resulting from use of the candidate ADF. The section is needed to authorize ARB to request these additional tests to obtain data on the candidate ADF.

Summary of section 2293.5(b)(3)(D)(3.)
Subsection (b)(3)(D)(3.) states that the applicant must provide evidence of substantial progress in working in good faith with the original equipment/engine manufacturers of the engines involved in the MOU, consensus standards organizations, regulatory agencies, and other interested parties, culminating in adoption of consensus standards by the end of Stage 2.

Rationale for section 2293.5(b)(3)(D)(3.)
This subsection is needed to provide ARB staff with assurances that the candidate ADF will be evaluated by all affected agencies during a multimedia evaluation in setting consensus standards for an ADF.

Summary of section 2293.5(b)(4)
Subsection (b)(4) is a framing sentence for subsequent subsections (b)(4)(A) through (b)(4)(D) relating to how the applicant must operate under a Stage 2 MOU

Rationale for section 2293.5(b)(4)
This section is necessary to apprise the applicant of the content of the subsequent subsections relating to operating under a Stage 2 MOU.

Summary of section 2293.5(b)(4)(A)
Subsection (b)(4)(A) states that the applicant must meet all the terms and conditions specified in the MOU.

Rationale for section 2293.5(b)(4)(A)
This section is needed to inform the applicant of their responsibility to adhere to the MOU terms and conditions.

Summary of section 2293.5(b)(4)(B)
Subsection (b)(4)(B) states that the Executive Officer may terminate or modify a MOU, with 30 days written notice to the applicant(s), for failure of the applicant(s) to comply with any of the terms and conditions of the MOU, failure to comply with any other applicable provision in this regulation, or for good cause, which may include

unacceptable risks to the community in which the pilot program is being conducted, or risks substantially outweighing the putative benefits of the candidate ADF.

Rationale for section 2293.5(b)(4)(B)
This subsection is needed to provide CARB with the authority to terminate a pilot program if necessary to protect the public health, or if the applicant is not meeting the terms and conditions of the MOU.

Summary of section 2293.5(b)(4)(C)
Subsection (b)(4)(C) informs the applicant that they may request a one year extension, renewable up to four times to complete their Stage 2 program; and that the Executive Officer may also extend their program duration for good cause, including completion of a multimedia evaluation.

Rationale for section 2293.5(b)(4)(C)
This subsection is needed to inform the applicant of their right to request up to four, one year extensions to complete their Stage 2 program. This section is also needed to provide CARB with the authority to extend the Stage 2 program for good cause, including completion of a multimedia evaluation.

Summary of section 2293.5(b)(4)(D)
Subsection (b)(4)(D) informs the applicant that they may sell, offer for sale, or supply an ADF intended for use in motor vehicles in California pursuant to either Stage 3A or 3B, whichever applies, as specified in section 2293.5(c) or (d), upon successful completion of the Stage 2 program.

Rationale for section 2293.5(b)(4)(D)
This subsection is needed to inform the applicant that successful completion the Stage 2 program allows full commercialization of their ADF under a Stage 3A or 3B program, whichever applies.

Summary of section 2293.5(b)(5)
Subsection (b)(5) is a framing sentence for subsequent subsections (b)(5)(A) through (b)(5)(E) relating to the multimedia evaluation and determination of significance threshold.

Rationale for section 2293.5(b)(5)
This subsection is needed to apprise the applicant of the content of the subsequent subsections relating to the multimedia evaluation and determination of significance threshold.

Summary of section 2293.5(b)(5)(A)
Subsection (b)(5)(A) states that the applicant shall conduct a prescribed multimedia evaluation under direction from ARB staff, pursuant to Health and Safety Code section 43830.8, the Multimedia Evaluation Guidance Document, and the approved Stage 2 MOU.

Rationale for section 2293.5(b)(5)(A)
This subsection is needed to inform the applicant of the requirement to conduct a multimedia evaluation pursuant to existing as well part of the Stage 2 MOU terms and conditions.

Summary of section 2293.5(b)(5)(B)
Subsection (b)(5)(B) states that the multimedia evaluation shall identify and evaluate any significant adverse impact on public health or the environment, including air, water, or soil, that may result from the production, use, or disposal of the ADF, relative to conventional CARB diesel, under Stage 2, 3A, and 3B.

Rationale for section 2293.5(b)(5)(B)
This section is needed to clearly identify the purpose of the multimedia evaluation conducted during Stage 2 of the regulation; the results of the multimedia evaluation will determine if the ADF proceeds to Stage 3A or 3B under 2293.5(b)(5)(C).

Summary of section 2293.5(b)(5)(C)
Subsection (b)(5)(C) states that the multimedia assessment shall also include an evaluation of potential mitigation measures for any significant impacts identified.

Rationale for section 2293.5(b)(5)(C)
This section is needed to provide the applicant with mitigation options, if needed, that would allow for further commercialization of their ADF while addressing any significant impacts identified during the multimedia evaluation.

Summary of section 2293.5(b)(5)(D)
Subsection (b)(5)(D) states that approval of a multimedia evaluation shall be subject to the provisions of Health and Safety Code section 43830.8.

Rationale for section 2293.5(b)(5)(D)
This section is needed to indicate the superseding statute governing the multimedia evaluation process conducted during Stage 2 of this regulation.

Summary of section 2293.5(b)(5)(E)
Subsection (b)(5)(E) states that the Executive Officer shall identify a significance threshold based on the multimedia evaluation conducted pursuant to this subsection. Approved significance thresholds shall be listed in Table 1 of section 2293.6

Rationale for section 2293.5(b)(5)(E)
This section is needed to direct the ARB to identify a significance threshold for the candidate ADF based on information learned during the multimedia evaluation and to identify where the significance thresholds shall be listed.

Summary of section 2293.5(b)(6)
Subsection (b)(6) is a framing sentence for subsequent subsections (b)(6)(A) through (b)(5)(F) which lists requirements to successfully complete the Stage 2 program, as well as disallowing the sale of the candidate ADF under Stage 3 without written approval from ARB.

Rationale for section 2293.5(b)(6)
This subsection is needed to introduce a list that will apprise the applicant of the requirements to successfully complete the Stage 2 program.

Summary of section 2293.5(b)(6)(A)
Subsection (b)(6)(A) states that the applicant must comply with all requirements specified in the approved Stage 2 MOU.

Rationale for section 2293.5(b)(6)(A)
This subsection is needed inform the applicant that they must comply with the Stage 2 MOU requirements to successfully complete the Stage 2 program.

Summary of section 2293.5(b)(6)(B)
Subsection (b)(6)(B) states that the applicant must achieve adoption of all consensus standards applicable to the ADF.

Rationale for section 2293.5(b)(6)(B)
This subsection is needed to affirm the final goal of Stage 2 and the multimedia evaluation's purpose.

Summary of section 2293.5(b)(6)(C)
Subsection (b)(6)(C) states that the applicant must obtain approval of at least 75% of compression ignition engine original equipment manufacturers for which the ADF is expected or intended to be used for the ADF blend levels expected or intended to be used in those engines.

Rationale for section 2293.5(b)(6)(C)
This subsection is needed to protect the public from engine malfunctions or the voiding the warranties for their vehicles, resulting from the commercialization of an ADF as a result of this regulation.

Summary of section 2293.5(b)(6)(D)
Subsection (b)(6)(D) states that the applicant must identify appropriate fuel specifications for the ADF and obtained written approval of those specifications by the Executive Officer.

Rationale for section 2293.5(b)(6)(D)
This subsection is needed to ensure ADF specifications remain consistent, thus providing certainty of fuel quality as well as establishing documented fuel parameters for testing, reporting, and enforcement purposes.

Summary of section 2293.5(b)(6)(E)
Subsection (b)(6)(E) states that the applicant must identify appropriate mitigation strategies for the ADF to be applied in the event the significance threshold identified by the Executive Officer is reached.

Rationale for section 2293.5(b)(6)(E)
This subsection is needed for ARB staff to request and obtain information needed as part of the monitoring for significance thresholds.

Summary of section 2293.5(b)(6)(F)
Subsection (b)(6)(F) states that the applicant must obtain a written determination by the Executive Officer that all the requirements of 2293.5(b)(6)(A) through 2293.5(b)(6)(E) have been met.

Rationale for section 2293.5(b)(6)(F)
This subsection is needed to reiterate the requirements of 2293.5(b)(6)(A) through 2293.5(b)(6)(E) as being necessary to a successful completion of the Stage 2 program.

Summary of section 2293.5(c)
Subsection 2293.5(c) introduces the reader to Stage 3A and begins a list of procedures, completed in subsequent subsections that shall apply to ADFs subject to mitigation before full commercial sale of the ADF is allowed.

Rationale for section 2293.5(c)
Subsection (c) is needed to provide context for subsequent subsections 2293.5(c)(1) through 2293.5(c)(5).

Summary of section 2293.5(c)(1)
Subsection 2293.5(c)(1) states that the Executive Officer shall determine the current ADF blend level and the blend level trajectory based on an analysis of ADF sales in recent year.

Rationale for section 2293.5(c)(1)
Subsection (c)(1) is needed to establish the first step CARB will take to determine significance thresholds for ADFs entering Stage 3.

Summary of section 2293.5(c)(2)
Subsection 2293.5(c)(2) states that the Executive Officer shall estimate the year(s) in which the effective ADF blend level is projected to reach 25%, 50%, 75%, and 95% of the significance threshold.

Rationale for section 2293.5(c)(2)
Subsection (c)(2) is needed to provide the ADF market with estimates of when mitigation may be needed allowing them to plan accordingly for costs attributable to mitigation if necessary.

Summary of section 2293.5(c)(2)(A)
Subsection 2293.5(c)(2)(A) states that the Executive Officer shall consider mitigating effects from a wide variety of factors when developing the estimates required in subsection (c)(2), using the methodology for calculating the effective ADF blend level in section 2293.6.

Rationale for section 2293.5(c)(2)(A)
Subsection (c)(2)(A) is needed to make clear that CARB will conduct a comprehensive review of information when determining for the significance levels described in subsection (c)(2).

Summary of section 2293.5(c)(2)(B)
Subsection 2293.5(c)(2)(B) states that the Executive Officer shall post the results of and basis for the estimates under (c)(2) on the ARB's website.

Rationale for section 2293.5(c)(2)(B)
This subsection is needed to inform the applicant that the ADF blend level estimates under (c)(2) will be made available, with explanation.

Summary of section 2293.5(c)(3)
Subsection 2293.5(c)(3) states that when the effective ADF blend level reaches 75% of the significance threshold, all suppliers of an affected ADF shall provide monthly reports to the Executive Officer; and that CARB post the mitigation strategies to be implemented once 95 percent of the significance threshold is reached.

Rationale for section 2293.5(c)(3)
This section is needed to inform the applicant of a potential change in reporting requirements and how the ADF blend level estimates will be made available to the public.

Summary of section 2293.5(c)(4)
Subsection 2293.5(c)(4) states that once the effective ADF blend level reaches 95% of the significance threshold, mitigation becomes mandatory and any ADF sold in the State must employ at least one of the mitigation strategies specified for that ADF.

Rationale for section 2293.5(c)(4)
This section is needed to inform the applicant of when the requirement to use a mitigation option would take effect.

Summary of section 2293.5(c)(5)
Subsection 2293.5(c)(5) states that individual producers of an ADF, may as a group, apply to the Executive Officer for an aggregate average mitigation plan. This subsection also informs the applicant of what is required for the this application as well as the Executive Officer's responsibility to advise the applicant in writing within 20 business days if the application is complete or not, and within 15 business if additional

information is submitted to make an application complete. This subsection also informs the applicant of information that will be considered by the executive officer when deciding to approve or disapprove the application and the process after a decision is made.

Rationale for section 2293.5(c)(5)
This section is needed to inform the applicant of an alternative option for mitigation requirements of Stage 3A, and the procedure for using said option.

Summary of section 2293.5(d)
Subsection 2293.5(d) states that if the Executive Officer determines that no significance threshold exists for an ADF, no mitigation measures or sales restrictions are required for that ADF. This section also states the applicant's new reporting requirements under Stage 3B, and the conduit for submitting them (LRT).

Rationale for section 2293.5(d)
This section is needed to inform the applicant of their new reporting requirements and authorization to pursue unlimited commercial sales of their ADF.

Summary of section 2293.5(d)(1)
Subsection 2293.5(d)(1) states that the applicant must report their sales volumes of ADF (A100) blendstock, if applicable.

Rationale for section 2293.5(d)(1)
This section is needed to inform the applicant of their reporting requirements under Stage 3B.

Summary of section 2293.5(d)(2)
Subsection 2293.5(d)(2) states that the applicant must report their sales volumes of ADF (A100) neat fuel, if applicable.

Rationale for section 2293.5(d)(2)
This section is needed to inform the applicant of their reporting requirements under Stage 3B.

Summary of section 2293.5(d)(3)
Subsection 2293.5(d)(3) states that the applicant must report their sales volumes of ADF/CARB diesel blend, if applicable.

Rationale for section 2293.5(d)(3)
This section is needed to inform the applicant of their reporting requirements under Stage 3B.

Section 2293.6 Significance Thresholds and Effective ADF Blend Levels

Summary of section 2293.6
Section 2293.6 states that an ADF for which a significance threshold has been determined, shall be subject to the Stage 3A provisions including mitigation requirements when the Executive Officer determines the effective ADF blend level will be at least 95% of the significance threshold. This section also provides a table as a reference tool demonstrating the significance thresholds and effective ADF blend levels for ADFs in Stage 3A.

Rationale for section 2293.6
This section is needed to provide a framework of the following subsections and to present the significance thresholds and effective ADF blend levels in a clear, easy to understand table.

Summary of section 2293.6(a)
Subsection 2293.6 (a) presents the formula that will be used to calculate the significance thresholds and effective ADF blend levels for biodiesel along with definitions for each of the variables used in the formula, including the specifications for Low NOx Diesel (one of the variables). This subsection also presents information regarding the effect of NTDE fleet penetration.

Rationale for section 2293.6(a)
This section is needed to inform the applicant of the methodology used to determine their candidate ADFs significance thresholds and effective ADF blend levels.

Summary of section 2293.6(b)
Subsection 2293.6 (b) states that "The effective ADF blend level for other ADFs is calculated as follows."

Rationale for section 2293.6(b)
This section is needed as a placeholder for formulas to calculate significance thresholds and effective ADF blend levels of emerging ADFs that may arise in the future.

Section 2293.7 Specifications for Alternative Diesel Fuels

Summary of section 2293.7
Section 2293.7 is a lead sentence to be completed in subsections 2293.7(a) and (b) that provide the specifications that must be met by ADFs, if not under a mitigation strategy in effect.

Rationale for section 2293.7
This section is needed to provide a framework for subsequent subsections.

Summary of section 2293.7(a)
Section 2293.7(a) is a title line for biodiesel the specification subsection.

Rationale for section 2293.7(a)
This section is needed to provide a framework for subsequent subsections.

Summary of section 2293.7(a)(1)
Subsection 2293.7(a)(1) provides the specification for biodiesel blendstock or neat fuel (B100).

Rationale for section 2293.7(a)(1)
This section is needed to legally establish the legal biodiesel blendstock or neat fuel specifications under this regulation.

Summary of section 2293.7(a)(2)
Subsection 2293.7(a)(2) that the fuel specifications promulgated by the California Department of Food and Agriculture for biodiesel are applicable to ADFs must be met for biodiesel.

Rationale for section 2293.7(a)(2)
This section is needed to ensure this regulation does not conflict with existing statutes.

Summary of section 2293.7(b)
Subsection 2293.7(b) is a placeholder for specifications for ADFs other than biodiesel.

Rationale for section 2293.7(b)
This section is needed as a placeholder for specifications of emerging ADFs that may arise in the future.

Section 2293.8 Reporting and Recordkeeping

Summary of section 2293.8(a)
Section 2293.8 (a) states that the applicable sampling methodology set forth in 13 CCR section 2296 shall be used for sampling of fuel properties as required by the MOU.

Rationale for section 2293.8(a)
This subsection is needed to provide the applicant with guidance regarding their sampling requirements.

Summary of section 2293.8(b)
Section 2293.8(b) identifies this subsection as pertinent to reporting requirements.

Rationale for section 2293.8(b)
This subsection is needed to provide a framework for subsequent subsections.

Summary of section 2293.8(b)(1)
Section 2293.8(b)(1) states that any person operating under a Stage 1 or Stage 2 MOU must submit quarterly reports to the Executive Officer and shall include information specified in subsequent subsections.

Rationale for section 2293.8(b)(1)
This subsection is needed to provide information regarding reporting requirements and as a lead sentence to be completed in with the specific reporting requirements in subsequent subsections.

Summary of section 2293.8(b)(1)(A)
Section 2293.8(b)(1)(A) states that applicant shall provide the volume of ADF and ADF blend offered, supplied, or sold during each quarter.

Rationale for section 2293.8(b)(1)(A)
This subsection is needed to provide the applicant with their reporting requirements.

Summary of section 2293.8(b)(1)(B)
Section 2293.8(b)(1)(B) states that applicant shall provide the results of a specified number of representative samples, for fuel properties by test methods specified in the MOU.

Rationale for section 2293.8(b)(1)(B)
This subsection is needed to provide the applicant with their reporting requirements.

Summary of section 2293.8(b)(1)(C)
Section 2293.8(b)(1)(C) states that applicant shall provide information regarding the progress made toward completing the terms of the MOU.
Rationale for section 2293.8(b)(1)(C)
This subsection is needed to provide the applicant with their reporting requirements.

Summary of section 2293.8(b)(1)(D)
Section 2293.8(b)(1)(D) states that applicant shall provide the information regarding any changes or updates to information submitted during the application process regarding the beneficial or adverse impacts of the ADF in California.

Rationale for section 2293.8(b)(1)(D)
This subsection is needed to provide the applicant with their reporting requirements.

Summary of section 2293.8(b)(2)
Section 2293.8(b)(2) states that except as a person operating within Stage 3A must submit monthly reports to the Executive Officer.

Rationale for section 2293.8(b)(2)
This subsection is needed to provide information regarding reporting requirements for Stage 3A and as a lead sentence to be completed in with the specific reporting requirements in subsequent subsections.

Summary of section 2293.8(b)(2)(A)
Section 2293.8(b)(2) states that applicant shall provide the information regarding the volume of ADF and ADF blend offered, supplied, or sold during each month.

Rationale for section 2293.8(b)(2)(A)
This subsection is needed to inform the applicant with their reporting requirements.

Summary of section 2293.8(b)(2)(B)
Section 2293.8(b)(2)(B) states that applicant shall provide the information regarding results of a specified number of representative samples, for fuel properties by test methods specified in the MOU.

Rationale for section 2293.8(b)(2)(B)
This subsection is needed to inform the applicant with their reporting requirements.

Summary of section 2293.8(b)(2)(C)
Section 2293.8(b)(2)(C) states that applicant shall provide the information regarding the volume of other applicable quantity of the mitigation strategy used during each month.

Rationale for section 2293.8(b)(2)(C)
This subsection is needed to inform the applicant with their reporting requirements.

Summary of section 2293.8(b)(2)(D)
Section 2293.8(b)(2)(D) states that applicant shall provide the information regarding the blend rate of the mitigation survey during each month, if applicable. And that items submitted under subsections 2293.8(b)(2)(A)- 2293.8(b)(2)(C) shall be submitted each month pursuant to a determination by the EO that the effective blend rate has reached 75 percent.

Rationale for section 2293.8(b)(2)(D)
This subsection is needed to inform the applicant with their reporting requirements.

Summary of section 2293.8(b)(3)
Section 2293.8(b)(3) states that except as a person operating within Stage 3B must submit monthly reports to the Executive Officer.

Rationale for section 2293.8(b)(3)
This subsection is needed to provide information regarding reporting requirements for Stage 3B and as a lead sentence to be completed in subsequent subsections, with specific reporting requirements.

Summary of section 2293.8(c)
Section 2293.8(c) identifies this subsection as pertinent to recordkeeping requirements.

Rationale for section 2293.8(c)
This subsection is needed to provide a framework for subsequent subsections.

Summary of section 2293.8(c)(1)
Section 2293.8(c)(1) states that the ADF producer shall maintain, for two years from the date of each sampling, records showing the sample date, product sampled, container or other vessel sampled, final blend volume, and the results of the fuel properties by the proscribed test methods.

Rationale for section 2293.8(c)(1)
This subsection is needed to inform the applicant with their recordkeeping requirements.

Section 2293.9 Severability

Summary of section 2293.9
Section 2293.8 states that each part of this subarticle shall be deemed severable, and in the event that any part of this subarticle is held to be invalid, the remainder of this subarticle shall continue in full force and effect.

Rationale for section 2293.9
This subsection is needed to inform the applicant of their responsibility to adhere to all applicable requirements of this regulation, in the event that any part of this subarticle shall be deemed severable.

Subarticle 3. Ancillary Provisions

Section 2294. Equivalent Test Methods

Summary of and Rationale for section 2294
This is former section 2293 renumbered to section 2294 and grouped under new subarticle 3 for consistency and ease of reading.

Section 2295. Exemptions for Alternative Motor Vehicle Used in Test Programs

Summary of and Rationale for section 2295
This is former section 2293.5 renumbered to section 2295 and grouped under new subarticle 3 for consistency and ease of reading.

Appendix 1 Mitigation Measures

Summary of Appendix 1
This appendix includes various mitigation measures that apply when the effective blend level of a particular ADF reaches 95% of the specified significance threshold, as provided in the regulation.

Rationale for Appendix 1
This appendix is needed to identify the mitigation measures that ensure the State does not reach the specific significance threshold identified for an air pollutant of concern.

Summary of Appendix 1 (a)(1)
This section includes all of the mitigation options that are currently available to mitigate NOx emissions from biodiesel using additives.

Rationale for Appendix 1 (a)(1)
This section is needed to help consolidate all additive based NOx emissions mitigation options for biodiesel in one place.

Summary of Appendix 1 (a)(1)(A)
This section details the mitigation option of using Di-tertbutyl peroxide (DTBP) to mitigate NOx emissions from biodiesel.

Rationale for Appendix 1 (a)(1)(A)
This section is needed to ensure that the right ratios of DTBP to biodiesel are used in order to achieve NOx mitigation.

Summary of Appendix 1 (a)(1)(B)
This section is reserved in case more additives that can mitigate NOx increases from biodiesel are found in the future and may be added to this regulation.

Rationale for Appendix 1 (a)(1)(B)
This section is needed in case additional additives are added as biodiesel mitigation strategies in the future.

Summary of Appendix 1 (a)(2)
This section contains specifications for a low-NOx diesel base fuel that when blended with biodiesel, mitigates any increases in NOx.

Rationale for Appendix 1 (a)(2)
This section is needed to specify which fuels are considered low-NOx diesel.

Summary of Appendix 1 (a)(3)
This section details an option for certifying alternative diesel fuels and additives that can mitigate any NOx increases from biodiesel.

Rationale for Appendix 1 (a)(3)
This section is needed to allow for the regulated industry to develop innovative methods of mitigating NOx.

Summary of Appendix 1 (a)(3)(A)
This section details the requirements for applying for a certified ADF that is emissions equivalent to CARB diesel.

Rationale for Appendix 1 (a)(3)(A)
This section is needed so that applicants have a clear idea of what ARB is asking for them and how long ARB will take to respond to their applications.

Summary of Appendix 1 (a)(3)(B)
This section details the requirements of the candidate fuel for any certification testing.

Rationale for Appendix 1 (a)(3)(B)
This section is needed to make it clear what the requirements are for any candidate fuel that is undergoing certification.

Summary of Appendix 1 (a)(3)(B)(i)
This section specifies what the makeup of the candidate fuel is required to be for certification of biodiesel formulations.

Rationale for Appendix 1 (a)(3)(B)(i)
This section is needed to make it specifically clear to the applicant what the candidate fuel must be for biodiesel formulations.

Summary of Appendix 1 (a)(3)(B)(ii)
This section specifies what the makeup of the candidate fuel is required to be for certification of biodiesel additives.

Rationale for Appendix 1 (a)(3)(B)(ii)
This section is needed to make it specifically clear to the applicant what the candidate fuel must be for biodiesel additives.

Summary of Appendix 1 (a)(3)(C)
This section specifies what properties the applicant must test for in their candidate fuel.

Rationale for Appendix 1 (a)(3)(C)
This section is needed to ensure that all of the most important properties for determining whether the candidate fuel is acceptable are tested for.

Summary of Appendix 1 (a)(3)(D)
This section lists the properties of the additive certification blendstock.

Rationale for Appendix 1 (a)(3)(D)
This section is needed to ensure that all additives are tested on an equal basis to each other.

Summary of Appendix 1 (a)(3)(E)
This section lists the properties of the reference fuel.

Rationale for Appendix 1 (a)(3)(E)
This section is needed to ensure that each certification is compared to the same baseline as any other diesel fuel or alternative diesel fuel formulation.

Summary of Appendix 1 (a)(3)(F)
This section details the requirements of the certification testing program.

Rationale for Appendix 1 (a)(3)(F)
This section is needed to ensure that all certification tests are done in an equivalent manner.

Summary of Appendix 1 (a)(3)(F)(i)
This section lists the acceptable engines for testing of each certification.

Rationale for Appendix 1 (a)(3)(F)(i)
This section is needed to ensure that each certification test is done on an equivalent engine to the others and therefore are comparable.

Summary of Appendix 1 (a)(3)(F)(ii)
This section specifies that the party doing certification testing must be agreeable to both the applicant and ARB, and that the applicant must bear any costs for testing.

Rationale for Appendix 1 (a)(3)(F)(ii)
This section is needed to ensure that testing is done at laboratories that meet ARBs standards of quality.

Summary of Appendix 1 (a)(3)(F)(iii)
This section covers the specific requirements of testing protocols.

Rationale for Appendix 1 (a)(3)(F)(iii)
This section is needed to ensure that each applicant is able to develop a test protocol that is uniform and meets the needs of staffs analysis.

Summary of Appendix 1 (a)(3)(F)(iii)1.
This section outlines the different cold start and hot start cycles that are available to the applicant and the acceptable order of testing.

Rationale for Appendix 1 (a)(3)(F)(iii)1.
This section is needed to ensure that the tests are done in a way that eliminates diurnal and other non-random influences on the data.

Summary of Appendix 1 (a)(3)(F)(iii)2.
This section specifies provisions for testing including observation and schedule.

Rationale for Appendix 1 (a)(3)(F)(iii)2.
This section is needed to ensure that staff is able to observe the testing if necessary.

Summary of Appendix 1 (a)(3)(F)(iv)
This section specifies which emissions must be measured with each test.

Rationale for Appendix 1 (a)(3)(F)(iv)
This section is needed to ensure that each applicant is aware of the emissions that are required to be tested.

Summary of Appendix 1 (a)(3)(G)
This section sets forth the criteria for passing a certification test.

Rationale for Appendix 1 (a)(3)(G)
This section is needed to set specific, uniform criteria by which a fuel passes or fails a certification test.

Summary of Appendix 1 (a)(3)(G)(i)
This section sets for the criteria that NOx and PM may not be higher for a candidate fuel that the reference fuel.

Rationale for Appendix 1 (a)(3)(G)(i)
This section is needed to ensure that passing fuels do not increase emissions.

Summary of Appendix 1 (a)(3)(G)(ii)
This section addresses the use of additives and additional criteria for fuels containing additives.

Rationale for Appendix 1 (a)(3)(G)(ii)
This section is needed to avoid unexpected emissions due to the use of additives.

Summary of Appendix 1 (a)(3)(G)(iii)
This section lays out the statistical calculation used to determine whether a fuel passes certification.

Rationale for Appendix 1 (a)(3)(G)(iii)
This section is needed to ensure fuels do not fail to pass based solely on reasonable random error.

Summary of Appendix 1 (a)(3)(H)
This section lays out what must be included in any MOU issued for fuels that pass certification.

Rationale for Appendix 1 (a)(3)(H)
This section is needed to ensure that MOUs issued to successful applicant are uniform and contain sufficient information as to be enforceable.

Summary of Appendix 1 (a)(3)(I)
This section covers requirements for in-use testing.

Rationale for Appendix 1 (a)(3)(I)
This section is needed to allow the use of in-use testing as an enforcement tool.

Summary of Appendix 1 (a)(3)(I)(i)
This section outlines what powers the executive officer has with regard to modifying executive orders issued to successful certifications, based on differences in emissions between the fuel tested and the fuel that is being sold.

Rationale for Appendix 1 (a)(3)(I)(i)
This section is needed to ensure that if applicants are selling a fuel that differs in emissions that what was tested, that can be accounted for in order to ensure no increase in emissions.

Summary of Appendix 1 (a)(3)(I)(ii)
This section details the rights of an applicant in the case that modifications to an Executive Order are needed.

Rationale for Appendix 1 (a)(3)(I)(ii)
This section is needed to let the applicant know their rights in case of a situation where an Executive Order needs to be modified.

Summary of Appendix 1 (b)
This section is a placeholder for mitigation measures for future ADFs.

Rationale for Appendix 1 (b)
This section is needed in case future ADFs go through the staged process and are found to need mitigation.

CHAPTER 12. REFERENCES

Note: The references are listed according to the footnote they correspond to in the ISOR. Not all footnotes are references and are only listed here to maintain the numbering system used for the ISOR footnotes. The footnotes that are not references are listed as "Explanatory Footnote."

Chapter 1. Introduction

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Chapter 4. Federal Policies Affecting Motor Vehicles Diesel Fuel

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Chapter 5. Description of Proposed Regulation

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Chapter 6. Technology Assessment

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Chapter 9. Environmental Justice and Local Communities

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Chapter 11. Summary and Rationale

No Reference Cited

Appendix A

No reference Cited

Appendix B

Studies referenced in Table B.2, *List of Studies from High Cetane Literature Search*

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Appendix C

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Appendix A

Proposed Regulation Order

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Appendix A
PROPOSED REGULATION ORDER

Adopt new sections 2293, 2293.1, 2293.2, 2293.3, 2293.4, 2293.5, 2293.6, 2293.7, 2293.8, 2293.9, and Appendix 1, title 13, California Code of Regulations (CCR), to read as follows:

[Note: The entire text of sections 2293, 2293.1, 2293.2, 2293.3, 2293.4, 2293.5, 2293.6, 2293.7, 2293.8, 2293.9, and Appendix 1 is new language and shown as plain text. Existing sections 2290, 2291, 2292.1, 2292.2, 2292.3, 2292.4, 2292.5, 2292.6, and 2292.7 would be grouped as indicated under new subarticle 1 (Specifications for Current Alternative Motor Vehicle Fuels). Existing sections 2293 and 2293.5 would be renumbered to 2294 and 2295 and would be grouped as indicated under new subarticle 3 (Ancillary Provisions). The proposed amendments to existing text are shown in underline to indicate addition and ~~strikeout~~ to show deletions. All other portions remain unchanged and are indicated by the symbol are shown in s 2293 and .]

Chapter 5. Standards for Motor Vehicle Fuels
Article 3. Specifications for Alternative Motor Vehicle Fuels

Subarticle 1. Specifications for Current Alternative Motor Vehicle Fuels

§2290. Definitions.

* * * * *

Note: Authority cited: Sections 39600, 39601, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

§2291. Basic Prohibitions.

* * * * *

Note: Authority cited: Sections 39600, 39601, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

§2292.1 Fuels Specifications for M100 Fuel Methanol.

* * * * *

Note: Authority cited: Sections 39600, 39601, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

§2292.2 Specifications for M-85 Fuel Methanol.

* * * * *

Note: Authority cited: Sections 39600, 39601, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

§2292.3 Specifications for E-100 Fuel Ethanol.

* * * * *

Note: Authority cited: Sections 39600, 39601, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

§2292.4 Specifications for E-85 Fuel Ethanol.

* * * * *

Note: Authority cited: Sections 39600, 39601, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

§2292.5 Specifications for Compressed Natural Gas.

* * * * *

Note: Authority cited: Sections 39600, 39601, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

§2292.6 Specifications for Liquefied Petroleum Gas.

* * * * *

Note: Authority cited: Sections 39600, 39601, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

§2292.7 Specifications for Hydrogen.

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Note: Authority cited: Sections 39600, 39601, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016,

43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

Subarticle 2. Commercialization of New Alternative Diesel Fuels

§2293. Purpose.

The purpose of this regulation is to establish a comprehensive, multi-stage process governing the commercialization of new alternative diesel fuels (ADF) in California, ranging from the initial limited sales of an ADF while it undergoes a screening evaluation; through expanded sales governed by enhanced monitoring, testing, and multimedia evaluations; and ending with full-scale commercial sales as warranted. This regulation is intended to foster the introduction and use of innovative ADFs in California while ensuring no significant adverse impacts overall on public health or the environment relative to conventional, petroleum-based CARB diesel.

Note: Authority cited: Sections 39600, 39601, 39667, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

§2293.1. Applicability.

(a) Starting January 1, 2015, no person shall sell, offer for sale or supply an alternative diesel fuel (ADF) intended for use in California unless the person is conducting such transactions pursuant to an approved Memorandum of Understanding issued to or otherwise applicable to that person under Stage 1 or 2 of this program, or the person is meeting all the applicable requirements under Stage 3A or 3B of this program.

(b) An ADF shall be deemed to be intended for use in motor vehicles in California if it is:

(1) stored at a facility which is equipped and used to dispense that type of alternative diesel fuel to motor vehicles, or

(2) delivered or intended for delivery to a facility which is equipped and used to dispense that type of alternative diesel fuel to motor vehicles, or

(3) sold, offered for sale or supplied to a person engaged in the distribution of motor vehicle fuels to motor vehicle fueling facilities, unless the person selling, offering or supplying the fuel demonstrates that he or she has taken reasonably prudent precautions to assure that the fuel will not be used as a motor vehicle fuel in California.

(c) For the purposes of this subarticle, each retail sale of alternative diesel fuel for use in a motor vehicle, and each supply of alternative diesel fuel into a motor vehicle

fuel tank, shall also be deemed a sale or supply by any person who previously sold or supplied such alternative diesel fuel in violation of this subarticle.

Note: Authority cited: Sections 39600, 39601, 39667, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

§ 2293.2. Definitions.

(a) For the purposes of sections 2293 through 2293.9, the definitions in Health and Safety Code sections 39010 through 39060 shall apply, except as otherwise specified in this subarticle 2:

(1) "Alternative diesel fuel" or "ADF" means any non-CARB diesel fuel used in a compression ignition engine that does not consist solely of hydrocarbons, and is not subject to a specification under title 13, CCR, section 2292. All ADFs that are substantially similar to an ADF subject to an approved Executive Order or MOU shall be deemed to fall within the class of ADFs subject to that same approved Executive Order or MOU.

(2) "Biodiesel" means a fuel comprised of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated B100, and meeting the specifications set forth by the ASTM International in the latest version of *Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels* D6751 contained in the ASTM publication entitled: Annual Book of ASTM Standards, Section 5, as defined in 4 CCR 4140(a).

(3) "Biodiesel Blend" means biodiesel blended with petroleum-based diesel fuel.

(4) "Blend Level" means the ratio of an ADF to the CARB diesel it is blended with, expressed as a percent by volume. The blend level may also be expressed as "AXX," where "A" represents the particular ADF and "XX" represents the percent by volume that ADF is present in the blend with CARB diesel (e.g., a 50% by volume biodiesel/CARB diesel blend is denoted as "B50").

(5) "Blendstock" means a component that is either used alone or is blended with another component(s) to produce a finished fuel used in a motor vehicle. A blendstock that is used directly as a transportation fuel in a vehicle is considered a finished fuel.

(6) "B5" means a biodiesel blend containing no more than five percent biodiesel by volume.

(7) "B20" means a biodiesel blend containing more than five and up to 20 percent biodiesel by volume.

(8) "CARB Diesel fuel" means a light or middle distillate fuel which may be comingled with up to five (5) volume percent biodiesel, and meeting the definition and requirements for "diesel fuel" or "California nonvehicular diesel fuel" as specified in 13 CCR 2281 et seq. "CARB Diesel fuel" may include, renewable diesel; gas-to-liquid fuels; Fischer-Tropsch fuels; CARB diesel blended with additives specifically formulated to reduce emissions of one or more criteria or toxic air contaminants relative to reference CARB diesel; and CARB diesel specifically formulated to reduce emissions of one or more criteria or toxic air contaminants relative to reference CARB diesel.

(9) "Criteria Pollutant" means any air pollutant for which a California ambient air quality standard (CAAQS) or a national ambient air quality standard (NAAQS) has been established. A list of air pollutants for which a CAAQS or NAAQS has been established can be found at http://www.arb.ca.gov/research/aaqs/aaqs2.pdf, June 2013, which is incorporated herein by reference.

(10) "Diesel Substitute" means any liquid fuel that is intended for use with CARB diesel or CARB diesel blends in a compression ignition engine. "Diesel substitute" includes, but is not limited to, renewable diesel; gas-to-liquid fuels; Fischer-Tropsch fuels; CARB diesel blended with additives specifically formulated to reduce emissions of one or more criteria or toxic air contaminants relative to reference CARB diesel; and CARB diesel specifically formulated to reduce emissions of one or more criteria or toxic air contaminants relative to reference CARB diesel.

(11) "Effective ADF Blend Level" means the actual, statewide-average ADF blend level, adjusted to account for various air pollution mitigating considerations, which may include but are not limited to, the use of various diesel substitutes that reduce air emissions of the pollutant for which the significance threshold was identified (e.g., renewable diesel, which reduces NOx emissions); the fleet penetration of new technology diesel engines; composition of the feedstocks used to produce the ADF; volumes of lower-emission CARB diesel fuel, including those with emissions-reducing additives; and other factors as deemed appropriate by the Executive Officer. The effective ADF blend level is compared to the significance threshold to determine when to apply mitigation strategies for those ADFs for which the Executive Officer has identified a significance threshold.

(12) "Executive Officer" means the Executive Officer of the Air Resources Board, or his or her designee.

(13) "Executive Order" means the document signed by the Executive Officer, or his or her designee, which specifies the stage at which a regulated party(ies) for an ADF is or will be operating under, as provided in this subarticle, and any

enforceable terms, conditions, and requirements applicable to the regulated party(ies) must meet in order to sell, offer for sale, or supply that ADF for use in California.

(14) "Finished Fuel" means a fuel that is used directly in a vehicle for transportation purposes without requiring additional chemical or physical processing.

(15) "Hydrocarbon" means any chemical or mixture that is composed solely of hydrogen and carbon.

(16) "Importer" has the same meaning as defined in the Low Carbon Fuel Standard (17 CCR 95481(a)).

(17) "LCFS" means the Low Carbon Fuel Standard (17 CCR 95480—95490).

(18) "Memorandum of Understanding (MOU)" means an enforceable agreement, executed between the Executive Officer and an applicant(s), which meets the requirements of this subarticle and specifies the terms and conditions by which the ADF at issue will be sold and used in California. MOUs issued under this subarticle are not subject to the Board's reservation of powers pursuant to Board Resolution 78-10 (February 23, 1978) or Resolution 05-40 (July 21, 2005).

(19) "Multimedia Evaluation" has the same meaning as defined in Health and Safety Code section 43830.8(b).

(20) "Multimedia Evaluation Guidance Document" means the procedure governing the Executive Officer's multimedia evaluation conducted prior to establishing a motor vehicle fuel specification. The multimedia evaluation guidance document ("Guidance Document and Recommendations on the Types of Scientific Information Submitted by Applicants for California Fuels Environmental Multimedia Evaluations") is available at www.arb.ca.gov/fuels/multimedia/guidancedoc.pdf, June 2008, which is incorporated herein by reference.

(21) "New Technology Diesel Engine (NTDE)" means a diesel engine that meets at least one of the following criteria:

(A) 2010 ARB emission standards for on-road heavy duty diesel engines under 13 CCR 1956.8.
(B) Tier 4 emission standards for non-road compression ignition engines under 13 CCR 2421, 2423, 2424, 2425, 2425.1, 2426, and 2427.
(C) Equipped with or employs a Diesel Emissions Control Strategy (DECS), verified by ARB pursuant to 13 CCR 2700 et seq., which uses selective catalytic reduction to control NOx.

(22) "Non-ester renewable diesel" means a diesel fuel that is produced from nonpetroleum renewable resources but is not a mono-alkyl ester and which is registered as a motor vehicle fuel or fuel additive under 40 CFR Part 79, as amended by Pub. L. 91-604.

(23) "Non-ester renewable diesel blend" means non-ester renewable diesel blended with petroleum-based diesel fuel.

(24) "Non-petroleum renewable resources" means non-fossil fuel resources including but not limited to biomass, waste materials, and renewable crude.

(25) "Performance Criteria" means a list of indicators, including but not limited to the total volume and volume percent represented by an ADF's sales in California, that are specified by the Executive Officer for use in determining whether the significance level for a pollutant has been reached or will be reached.

(26) "Person" has the same meaning as defined in Health and Safety Code section 39047 and includes, but is not limited to, alternative diesel fuel producers, importers, marketers and blenders. "Person" includes the plural when two or more persons are subject to an Executive Order executed or an interim or final fuel specification issued pursuant to the requirements of this subarticle.

(27) "Producer" has the same meaning as defined in the Low Carbon Fuel Standard (17 CCR 94581(a)).

(28) "Reference CARB Diesel" has the same meaning as "reference fuel" as that term is defined in 13 CCR 2282(g)(3).

(29) "Significance Level" means, for a given pollutant X, either of the following, whichever applies:

(A) For an ADF blended with CARB diesel, the significance level means the blend level of the ADF below which the combined effects of:

1. the use of the ADF in new technology diesel engines, and
2. the use of diesel substitutes that reduce emissions of X result in no increase in the emissions of X.

(B) For an ADF used as a neat fuel, the significance level means any use of the ADF below which there is no increase in the emissions of X.

(30) "Toxic Air Contaminant" means any substance identified or designated by the Air Resources Board as a toxic air contaminant pursuant to Health and Safety

Code sections 39655 or 39657, or is designated as a hazardous air pollutant under section 112 of the federal Clean Air Act (42 U.S.C 7412).

(31) "Trade Secret" has the same meaning as defined in Government Code section 6254.7.

(b) List of Acronyms and Abbreviations

AAQS	Ambient Air Quality Standards
ADF	Alternative Diesel Fuels
ARB or Board	California Air Resources Board
CAA or the Act	Clean Air Act
CDFA	California Department of Food and Agriculture
CEPC or Council	California Environmental Policy Council
CEQA	California Environmental Quality Act
CO	Carbon Monoxide
CCR	California Code of Regulations
DME	Dimethyl Ether
DMS	Division of Measurement Standards, (Division within CDFA)
EISA	Energy Independence and Security Act of 2007
EO	Executive Officer
FAME	Fatty Acid Methyl Esters
GHG	Greenhouse Gas
HC	Hydrocarbons
H&SC	California Health and Safety Code
LCFS	California Low Carbon Fuel Standard
MMT	Million Metric Tons
MMWG	Multimedia Working Group
MOU	Memorandum of Understanding
NOx	Oxides of Nitrogen
NREL	National Renewable Energy Lab
NTDE	New technology diesel engines
OSFM	Office of the State Fire Marshal
PAHs	Polycyclic Aromatic Hydrocarbons
PM	Particulate Matter
ppmw	Parts per Million by Weight
RFS	Renewable Fuels Standard
SCR	Selective Catalytic Reduction
SWRCB	California State Water Resources Control Board
SVO	Straight Vegetable Oil
U.S. EPA	U.S. Environmental Protection Agency

UST	Underground Storage Tanks
WVO	Waste Vegetable Oil

Note: Authority cited: Sections 39600, 39601, 39667, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

§2293.3. Exemptions.

This subarticle does not apply to any of the following, as specified:

(a) Fuels that have a specification under sections 2292—2292.7 of subarticle 1;

(b) CARB diesel blends comprised solely of CARB diesel and one or more diesel additives comprising in the aggregate no more than 1.0 percent by volume of the CARB diesel blend. This provision does not apply to additives used pursuant to the mitigation measures specified in Appendix 1;

(c) ADF fuels used in fleets comprising 95 percent or more new technology diesel engines (NTDE) are presumed to be exempt from the mitigation requirements specified in this subarticle. To the extent the use of an ADF in such NTDEs reduce or result in no greater emissions of one or more criteria, toxic, or other air pollutants relative to conventional CARB diesel, the Executive Officer may include the volume and emission reduction ability of that ADF in those NTDEs when determining whether the significance threshold has been reached in a specified year and, if so, the extent mitigation is required pursuant to section 2293.6; and

(d) CARB diesel fuel is exempt from the mitigation requirements specified in this subarticle. To the extent the use of CARB diesel fuel with beneficial properties reduces emissions of one or more criteria, toxic, or other air pollutants relative to conventional CARB diesel, the Executive Officer may include the volume and emission reduction ability of that CARB diesel fuel when determining whether the significance threshold has been reached in a given year and, if so, the extent mitigation is required pursuant to section 2293.6.

Note: Authority cited: Sections 39600, 39601, 39667, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

§2293.4. General Requirements Applicable to All ADFs.

In addition to the requirements in 2293.5, starting January 1, 2015, no person shall sell, offer for sale or supply an ADF intended for use in motor vehicles in California unless that ADF meets the requirements set forth in this subarticle 2.

(a) Has been registered with U.S. EPA under 40 CFR part 79 prior to its first sale, offer for sale, or supply for use in California.

(b) Meets all applicable regulatory requirements promulgated by the California Department of Food and Agriculture (including, but not limited to, 4 CCR sections 4140—4148, 4200, and 4202—4205).

(c) Meets all other applicable local, State, and federal requirements.

Note: Authority cited: Sections 39600, 39601, 39667, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

§2293.5. Phase-In Requirements.

[Note: The goal of this comprehensive process is to foster the introduction of new, lower polluting ADF fuels by allowing the limited sales of innovative ADFs in stages while emissions, performance, and environmental impacts testing is conducted. This testing is intended to develop the necessary, real-world information to quantify the environmental and human health benefits from using new ADFs, determine whether these fuels have any significant adverse environmental impacts relative to conventional CARB diesel, and identify any vehicle/engine performance issues such fuels may have.]

It is a violation of this article for any person to sell, offer for sale, or supply an ADF intended for use in motor vehicles in California that does not meet the requirements of this subarticle or an approved Stage 1 MOU, Stage 2 MOU, or an applicable fuel specification under Stage 3A or 3B, as provided in this subarticle.

(a) *Stage 1: Pilot Program.*

[Note: The purpose of this stage is to allow limited, small fleet use of innovative fuels while requiring screening tests and assessments to quickly determine whether there will be unreasonable potential impacts on air quality, the environment and vehicular performance. Such data will help inform more extensive testing and analysis to be conducted in Stage 2. This Stage 1 is modeled after the existing ARB regulation that provides limited, fuel test program exemptions under 13 CCR 2259.]

(1) Stage 1 Application.

No person, who is not already subject to Stage 2 or has obtained an approved fuel specification under Stage 3A or 3B, may sell, offer for sale, or supply a candidate ADF intended for use in motor vehicles in California without an approved Stage 1 MOU governing the limited sales and use of that candidate ADF. A person seeking a Stage 1 MOU must by submit an application to the Executive Officer that includes all the following information:

(A) Expected program duration, not to exceed one year except as provided in section 2293.5(a)(4)(B) below;
(B) An estimate of the maximum number of vehicles or engines involved in the program;
(C) The mileage duration per vehicle involved in this stage;
(D) The quantity of fuel expected to be used in the pilot program, not to exceed the energy equivalent of one million gallons of diesel fuel per year, per ADF total;
(E) The site(s) in which the testing during this stage will be conducted (including the street address, city, county, and zip code);
(F) The manner in which the distribution pumps will be labeled to ensure proper use of the test fuel;
(G) The name, address, telephone number, title of the person(s) and the name of the company or organization requesting entry into a Stage 1 pilot program; and
(H) If different from the information in (G) above, the name, address, telephone number and title of the person(s) and the name of the company or organization responsible for recording and making the information specified above available to the Executive Officer and the location in which such information will be maintained.
(I) Chemical and physical properties of the candidate ADF: complete chemical speciation, Chemical Abstract Services (CAS) numbers (if available), density, energy content, vapor pressure, oxidative potential, distillation curve, log K_{ow} (water-octanol partition coefficient), and Henry's law coefficient.
(J) Environmental information about the ADF: Material Safety Data Sheet(s) (MSDS) for all components of the candidate ADF, production process diagram, identification of potential human health effects, lifecycle flow diagram (including all stages of the process-raw material extraction, manufacturing, distribution, use and disposal including all intervening transportation steps), and potential release scenarios during production (including by-products), transportation and use.
(K) Identify whether the fuel is intended to be blended with diesel, whether it can be used as a neat fuel, or whether it can be used either way.
(L) Plan for commercialization under this regulation.
(M) Emissions testing completed on criteria pollutants.

(N) Attestation that the vehicles to be used in the pilot program are owned by the applicant or the applicant has received written consent from their owners.

(O) The vehicle identification number (VIN) of each vehicle participating in the pilot program.

(P) Affirmative statement that the owner(s) of all vehicles to be used in the applicant's pilot program are aware of any possible warranty issues that may arise from the use of the candidate ADF or candidate ADF/CARB diesel blend in their engines.

(Q) A declaration by the applicant that:

1. there is an existing fuel standard for the ADF as required by Business and Professions Code Chapter 14, sections 13400 to 13460; or if no such standard exist,

2. a copy of the developmental fuel variance the applicant has submitted to the California Department of Food and Agriculture pursuant to Business and Professions Code section 13405 and proof of its approval; and,

3. the requirements of Business and Profession Code Section 12001–13800 other than fuel quality have been met; and,

4. the California Department of Food and Agriculture received a copy of the application required to be submitted under 13 CCR §2293.5.

(R) Proof that the candidate ADF has been registered with the U.S. Environmental Protection Agency under 40 CFR 79.

It is the responsibility of the applicant to identify any specific portion of the information submitted above as trade secret. Any such trade secret information identified by the applicant shall be treated pursuant to 17 CCR 91000—91022 and the California Public Records Act (Government Code sec. 6250 et seq.).

(2) Stage 1 Application Completeness Determination.

(A) After receiving a pilot program application, the Executive Officer shall advise the applicant in writing within 20 business days either that the application is provisionally complete or that specified additional information is required to make it provisionally complete.

(B) After receiving the additional information required under (A), the Executive Officer shall advise the applicant in writing within 15 business days either that the application is now provisionally complete or that specified additional information is still required to make it complete.

(C) If additional information is required and not received within 60 days the application will be deemed incomplete.

(3) Public Comment and Final Action on a Stage 1 Application.

(A) After deeming an application provisionally complete, the Executive Officer shall post the application on ARB's internet web site at for 15 business days for public comments. Only comments related to potential factual or methodological errors may be considered by the Executive Officer. Within 30 calendar days, the applicant shall either make revisions to its application and submit those revisions to the Executive Officer, or submit a detailed written response to the Executive Officer explaining why no revisions are necessary.

(B) Within 20 business days of receiving the applicant's response to the public comments under (A), the Executive Officer shall either approve or disapprove the pilot program. The Executive Officer shall notify the applicant of his/her decision in writing and provide, if the application is denied, the reasons for the denial.

(C) The Executive Officer shall disapprove a proposed pilot program if he/she determines the use of the candidate ADF, under the terms and conditions of the pilot program as proposed, poses an unacceptable risk to the community in which the pilot program is proposed to be conducted, or its risks substantially outweigh the putative benefits of using the candidate ADF.

(D) No approval of a pilot program shall be effective without an approved Memorandum of Understanding (MOU) executed between the Executive Officer and the applicant(s). The MOU shall include terms and conditions that the applicant must meet in order to provide the candidate ADF fuel in California during the term of the MOU. The terms and conditions shall be based on the information specified in (1)(A)--(R) above, as well as require the following:

1. any additional information the Executive Officer determines is necessary to fill in data gaps that may have been identified during the application process;

2. additional toxicity and other testing the Executive Officer determines is necessary and appropriate to better characterize any substance in the candidate ADF; and

3. evidence of substantial progress in working in good faith with the original equipment/engine manufacturers of the engines involved in the MOU, consensus standards organizations (e.g., ASTM),

regulatory agencies, and other interested parties toward developing a consensus set of fuel specifications for the candidate ADF.

4. The use of adequate controls to ensure appropriate fuel quality and performance in consideration of vehicle performance, impact on the environment and fuel production. Appropriate controls include but are not limited to the use of interim fuel specifications and consensus standards.

(4) Operation under a Stage 1 MOU.

(A) For the duration of the MOU, the applicant must meet all the terms and conditions specified therein;

(B) The Executive Officer may terminate or modify a MOU, with 30 days written notice to the applicant(s), for failure of the applicant(s) to comply with any of the terms and conditions of the MOU, failure to comply with any other applicable provision in this subarticle, or for good cause. Good cause includes, but is not limited to, a determination by the Executive Officer that the information submitted in the application was inaccurate or incomplete and that the use of the ADF, under the terms and conditions of the approved pilot program, may pose an unacceptable risk to the community in which the pilot program is being conducted, or its risks substantially outweigh the putative benefits of using the candidate ADF;

(C) The Executive Officer shall not revoke or modify an approved Stage 1 MOU without first affording the applicant an opportunity for a hearing in accordance with 17 CCR 60040 et seq.;

(D) In the event an applicant cannot complete an approved pilot program within the allotted time, the applicant(s) may request a six month extension, renewable up to three times; and

(E) Upon successful completion of the pilot program, the applicant(s) may submit an application for a Stage 2 MOU, as specified in section 2293.5(b) below.

(b) *Stage 2: Development of Fuel Specification.*

[Note: The purpose of this stage is to allow limited but expanded fleet use of an ADF that has successfully undergone the Stage 1 pilot program. Stage 2 candidate ADFs undergo additional emissions and performance testing to better characterize potential impacts on air quality, the environment and vehicular performance. This testing and assessment will be conducted pursuant to a formal multimedia evaluation leading to the development of a fuel specification, as appropriate. Further, the multimedia evaluation

will be the basis for determining whether the candidate ADF has an associated significance threshold for any criteria, toxic, or other air pollutant. The establishment of a significance threshold determines whether the candidate ADF can proceed to mitigated sales under Stage 3A or unmitigated sales under Stage 3B.]

(1) Stage 2 Application.

A person who has successfully completed a pilot program for a candidate ADF under section 2293.5(a) may apply for entrance into a Stage 2 for that candidate ADF. An applicant for Stage 2 must submit an application to the Executive Officer that includes all the following information:

(A) Planned duration for this stage, not to exceed one year, renewable up to four times or as otherwise provided in section 2293.5(b)(4);

(B) An estimate of the maximum number of vehicles or engines involved in this stage along with a description of the emissions control technology;

(C) The mileage duration per vehicle involved in this stage;

(D) The quantity of the candidate ADF fuel expected to be used in this stage, not to exceed the energy equivalent of 30 million gallons of diesel fuel per year;

(E) The site(s) in which the testing during this stage will be conducted (including the street address, city, county, and zip code);

(F) Any changes or updates to the information submitted under 2293.5(a)(1)(F)—(S) to reflect the expanded scope of vehicles, locations, fuel volume, timeframe, and other aspects of operation under Stage 2. For each of these items, the applicant must specify whether there has been no change or update, or if there has been a change or update, what that change or update is; and

(G) Identification of the test lab and principal investigator, including his/her curriculum vitae, who will be conducting the multimedia evaluation for the candidate ADF.

It is the responsibility of the applicant to identify any specific portion of the information submitted above as trade secret. Any such trade secret information identified by the applicant shall be treated pursuant to 17 CCR 91000—91022 and the California Public Records Act (Government Code sec. 6250 et seq.).

(2) Stage 2 Application Completeness Determination

(A) After receiving a Stage 2 application, the Executive Officer shall advise the applicant in writing within 20 business days either that the application is provisionally complete or that specified additional information is required to make it provisionally complete;

(B) After receiving the additional information required under (A), the Executive Officer shall advise the applicant in writing within 15 business days either that the application is now provisionally complete or that specified additional information is still required to make it provisionally complete.

(3) Public Comment and Final Action on a Stage 2 Application

(A) After deeming an application provisionally complete, the Executive Officer shall post the application on ARB's internet web site for 30 calendar days for public comments. Only comments related to potential factual or methodological errors or information regarding vehicle performance may be considered by the Executive Officer. Within 30 days, the applicant shall either make revisions to its application and submit those revisions to the Executive Officer, or submit a detailed written response to the Executive Officer explaining why no revisions are necessary;

(B) Within 20 business days of receiving the applicant's response to the public comments under (A), the Executive Officer shall either approve or disapprove the Stage 2 application. The Executive Officer shall notify the applicant of his/her decision in writing and provide, if the application is denied, the reasons for the denial;

(C) The Executive Officer shall disapprove a proposed pilot program if he/she determines the use of the ADF, under the terms and conditions of the Stage 2 program as proposed, poses an unacceptable risk to the community(ies) in which the program is proposed to be conducted, or its risks substantially outweigh the putative benefits of using the ADF;

(D) No approval of a Stage 2 program shall be effective without an approved Memorandum of Understanding (MOU) executed between the Executive Officer and the applicant(s). The MOU shall include terms and conditions that the applicant must meet in order to provide the ADF fuel in California during the term of the MOU. The terms and conditions shall be based on the information specified in (1)(A)-(G) above, as well as require the following:

1. any additional information requested in writing by the Executive Officer to fill in data gaps that may have been identified during the application process;

2. additional toxicity and other testing the Executive Officer determines is necessary and appropriate to better characterize any substance in the ADF;

3. substantial progress in working in good faith with the original equipment/engine manufacturers of the engines involved in the MOU (e.g., Westport, Volvo, etc.), consensus standards organizations (e.g., ASTM), regulatory agencies, and other interested parties toward developing a consensus set of fuel specifications for the ADF. These efforts must culminate in adoption of consensus standards by the end of the Stage 2 MOU.

(4) Operation under a Stage 2 MOU

(A) For the duration of the MOU, the applicant must meet all the terms and conditions specified therein;

(B) The Executive Officer may terminate a MOU, with 30 days written notice to the applicant(s), for failure of the applicant(s) to comply with any of the terms and conditions of the MOU, failure to comply with any other applicable provision in this subarticle, or for good cause. Good cause includes, but is not limited to, a determination by the Executive Officer that the information submitted in the application was inaccurate or incomplete and that the use of the ADF, under the terms and conditions of the approved Stage 2 program, may pose an unacceptable risk to the community in which the Stage 2 program is being conducted, or its risks substantially outweigh the putative benefits of using the ADF;

(C) In the event an applicant cannot complete an approved Stage 2 program within the allotted time, the applicant(s) may request a 1 year extension, renewable up to four times. The Executive Officer may provide additional extensions due to delays in completion of a multimedia evaluation, adoption of the applicable consensus standards, or for other good cause;

(D) Upon successful completion of the Stage 2 program, the applicant(s) may sell, offer for sale, or supply an ADF intended for use in motor vehicles in California pursuant to either Stage 3A or 3B, whichever applies, as specified in section 2293.5(c) or (d) below.

(5) Multimedia Evaluation and Determination of Significance Threshold

(A) Pursuant to the approved Stage 2 MOU, Health and Safety Code section 43830.8, and the Multimedia Evaluation Guidance Document, the applicant shall conduct the prescribed multimedia evaluation under direction from ARB staff;

(B) The multimedia evaluation shall identify and evaluate any significant adverse impact on public health or the environment, including air, water, or soil, that may result from the production, use, or disposal of the ADF, relative to conventional CARB diesel, under Stage 2, 3A, and 3B;

(C) In addition to determining any significant impacts, the multimedia assessment shall also include an evaluation of potential mitigation measures for each of the significant impacts identified;

(D) Approval of a multimedia evaluation shall be subject to the provisions of Health and Safety Code section 43830.8;

(E) The Executive Officer shall identify a significance threshold based on the multimedia evaluation conducted pursuant to this subsection. Approved significance thresholds shall be listed in Table 1 of section 2293.6.

(6) Completion of Stage 2

No person operating under Stage 2 may sell, offer for sale, or supply an ADF for use in motor vehicles in California under Stage 3A or 3B unless the Executive Office has determined in writing that the person has successfully completed the requirements of Stage 2. To be deemed as successfully completing Stage 2, the applicant must meet all the following requirements:

(A) Comply with all requirements specified in the approved Stage 2 MOU;

(B) Adopt consensus standards applicable to the ADF;

(C) Obtain approval of at least 75 percent of compression ignition engine original equipment manufacturers for which the ADF is expected or intended to be used. Such approval must represent approval of the ADF blend levels expected or intended to be used in those engines;

(D) Identify appropriate fuel specifications for the ADF and obtained written approval of those specifications by the Executive Officer;

(E) Identify appropriate mitigation strategies for the ADF to be applied in the event the significance threshold identified by the Executive Officer is reached; and

(F) Obtain a written determination by the Executive Officer that all the above requirements have been met.

In the event the Executive Officer identifies a significance threshold under (5)(D) above, the Executive Officer shall post notice on the ARB website his/her intent to initiate a rulemaking to incorporate the significance threshold and approved mitigation strategies into this subarticle. Upon completion of that rulemaking, all persons subject to Stage 2 for an ADF shall be subject to the provisions of Stage 3A.

(c) *Stage 3A: Commercial Sales Subject to Mitigation*

In the event the Executive Officer has determined there is a significance threshold for an ADF, the following procedure shall apply:

(1) The Executive Officer shall first determine the current ADF blend level and the blend level trajectory based on an analysis of ADF sales in recent years;

(2) Based on the analysis in (c)(1), the Executive Officer shall estimate the year(s) in which the effective ADF blend level is projected to reach 25%, 50%, 75%, and 95% of the significance threshold.

(A) In estimating these levels, the Executive Officer shall consider mitigating effects from various factors, including various diesel substitutes that reduce air emissions of the pollutant for which the significance threshold was identified (e.g., renewable diesel, which reduces NOx emissions); the fleet penetration of new technology diesel engines; composition of the feedstocks used to produce the ADF; volumes of lower-emission CARB diesel fuel, including those with emissions-reducing additives; and other factors as deemed appropriate by the Executive Officer. These factors shall be considered in determining the effective ADF blend level at a specific point (e.g., the ADF blend level adjusted to account for various mitigating factors such as the use of new technology diesel engines and renewable diesel). The effective ADF blend level will then be compared to the significance threshold to determine when mitigation must be applied. The methodology for calculating the effective ADF blend level is specified in section 2293.6.

(B) The Executive Officer shall post the results of and basis for such estimates on the ARB's website;

(3) When the effective ADF blend level reaches 75% of the significance threshold, the Executive Officer shall post on the ARB website a notice of intent to apply the mitigation strategies identified in Appendix 1 for the ADF

when the effective ADF blend level is projected to reach 95% of the significance threshold. Once the 75% level is reached, all suppliers of an affected ADF shall provide monthly reports to the Executive Officer, as specified in section 2293.8, additionally at this point all producers and importers of the affected ADF shall submit a mitigation plan in accordance with 2293.5(c)(5);

(4) Once the effective ADF blend level has reached 95% of the significance threshold, the requirement to apply mitigation becomes effective and any producer or importer of the affected ADF shall comply with the terms of the mitigation plan by which they are covered. Each mitigation plan shall apply mitigation on a proportion of their total fuel equal to difference between the projected effective blend level and 95 percent of the significance level for each year.

(5) Individual producers or importers of ADF or a group of producers or importers of an ADF may apply to the Executive Officer for a mitigation plan. The application shall include the location of each production or import facility included in the plan, the amount of ADF production or importation capacity of each facility, the amount of ADF produced or imported at each facility for the prior two years, and an exact description of how the producer, importer, or group intends to mitigate emissions of pollutants of concern related to their production or importation using the mitigation options in Appendix 1. After receiving an application for a mitigation plan, the Executive Officer shall advise the applicant in writing within 20 business days either that the application is complete or that specified additional information is required to make it complete. After receiving additional information, the Executive Officer shall advise the applicant in writing within 15 business days that either the application is now complete or that specified additional information is still required to make it complete. After deeming an application complete, the Executive Officer shall approve or deny the application. In determining whether or not to approve the application the Executive Officer shall consider in their analysis any regional or seasonal effects that may occur based on the mitigation plan. If the Executive officer denies the application, he/she shall notify the applicant in writing of that determination. If the Executive Officer approves the application, he/she shall issue an Executive Order to the applicant(s) deeming them in compliance with the mitigation portion requirements of this regulation.

Stage 3B: Commercial Sales Subject to No Mitigation

If the Executive Officer has determined that there is no significance threshold for an ADF, no mitigation measures or sales restrictions are required for that ADF. For an ADF that is subject to this provision, the fuel provider shall report to the Executive Officer the following information on a quarterly basis for any such ADF the fuel provider sold, offered for sale, or supplied for use in California:

(1) The volume of ADF (A100) blendstock, if applicable;
(2) The volume of ADF (A100) neat fuel, if applicable;
(3) The volume of ADF/CARB diesel blend, if applicable.

For purposes of this provision, the fuel provider may use information submitted to the ARB through the Low Carbon Fuel Standard Reporting Tool (LRT), as appropriate.

Note: Authority cited: Sections 39600, 39601, 39667, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

§2293.6. Significance Thresholds and Effective ADF Blend Levels.

An ADF for which a significance threshold has been determined by the Executive Officer shall be subject to the Stage 3A provisions specified in section 2293.5. The specific mitigation requirements in Appendix 1 shall apply at the time the Executive Officer determines the effective ADF blend level will be at least 95% of the significance threshold.

Table A.1. Significance Thresholds

Alternative Diesel Fuel	Significance Threshold	Effective ADF Blend Level	Comments
Biodiesel	10 % blend level	See 2293.6(a)	NOx is the pollutant of concern
[Reserved]	[Reserved]	[Reserved]	[Reserved]
[Reserved]	[Reserved]	[Reserved]	[Reserved]

(a) The effective ADF blend level for biodiesel is calculated as follows:

$$EB = 100 \times \left[\frac{NBV - 0.5LN - 0.73RD - VM - 0.55AB}{TCV}\right]$$

Where,

EB = effective ADF blend level, expressed as percent biodiesel

NBV = net volume of biodiesel used in compression-ignition engines in California, excluding gallons used in B5 or less, expressed in gallons

NBV = net volume of biodiesel used in compression-ignition engines in California, excluding gallons used in B5 or less, expressed in gallons

LN = volume of low-NOx diesel used in compression-ignition engines in California, excluding renewable diesel, expressed in gallons

RD = volume of renewable diesel used in compression-ignition engines in California, expressed in gallons

VM = volume of biodiesel, employing one of the mitigation strategies specified in Appendix 1 prior to the date mitigation is required under 2293.5(c)(4), used in compression-ignition engines in California, expressed in gallons

AB = volume of animal-fats-based biodiesel used in compression-ignition engines in California, excluding gallons used in B5 or less, expressed in gallons

TCV = total volume of all fuels used in compression-ignition engines in California (not including any fuel with a specification under 13 CCR 2292), expressed in gallons

Low-NOx diesel (LN) means a diesel fuel that meets the following specifications:

Table A.2. Fuel Specifications for Low-NOx Diesel Fuel

Property	Test Method	Limit
Unadditized Cetane Number	ASTM D6890-13a	≥ 67
Total Aromatics	ASTM D5186-03(2009)	≥ 6.4 mass %
Polycyclic Aromatic Hydrocarbons	ASTM D5186-03(2009)	≥ 0.6 mass %
API Gravity	ASTM D287-12b	≥ 47.4 degrees API

When the ratio of New Technology Diesel Engines in the California heavy duty vehicle fleet is 95 percent or greater, as determined using the latest version of EMFAC, the effective blend level will be deemed to be B0 or zero percent, and no mitigation will be required.

(b) The effective ADF blend level for other ADFs is calculated as follows:

[Reserved for future use]

Note: Authority cited: Sections 39600, 39601, 39667, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

§2293.7. Specifications for Alternative Diesel Fuels.

Unless otherwise required by a mitigation strategy in effect, any ADF that is sold, offered for sale, supplied for use in California, produced, or imported into California must meet the following specifications:

(a) Specifications for Biodiesel.

(1) *Biodiesel Blendstock or Neat Fuel (B100).*

Table A.3. Fuel Specifications for B100

Property	Test Method	Value
Unadditized Cetane Number	ASTM D613-10ae1	≥47
API Gravity	ASTM D287-12b	≥27 degrees API
Sulfur	ASTM D5453-93	≤15 ppm

(2) *Biodiesel Blends.* The fuel specifications promulgated by the California Department of Food and Agriculture in 4 CCR sections 4140-4148, 4200, and 4202-4205 shall apply to any biodiesel blend.

(b) Specifications for Other Alternative Diesel Fuels:

Table A.4. Fuel Specifications for Other ADFs

ADF	Property	Test Method	Value
[Reserved]	[Reserved]	[Reserved]	[Reserved]
[Reserved]	[Reserved]	[Reserved]	[Reserved]
[Reserved]	[Reserved]	[Reserved]	[Reserved]
[Reserved]	[Reserved]	[Reserved]	[Reserved]

Note: Authority cited: Sections 39600, 39601, 39667, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

§2293.8. Reporting and Recordkeeping.

(a) Sampling

For reporting of fuel properties as required by the MOU, an applicable sampling methodology set forth in 13 CCR section 2296 shall be used.

(b) Reporting

(1) For Stages 1 and 2

A person operating under a Stage 1 or Stage 2 MOU must submit quarterly reports to the Executive Officer throughout the term of the MOU. Each report shall include the following:

(A) The volume of ADF and ADF blend offered, supplied, or sold during each quarter;
(B) Results of a specified number of representative samples, for fuel properties by test methods specified in the MOU;
(C) Progress made toward completing the terms of the MOU;
(D) Any changes or updates to information submitted during the application process regarding the beneficial or adverse impacts of the ADF in California.

(2) For Stage 3A

Except as provided in this paragraph, a person operating within Stage 3A must submit monthly reports to the Executive Officer. Each report shall include the following:

(A) The volume of ADF and ADF blend offered, supplied, or sold during each month;
(B) Results of a specified number of representative samples, for fuel properties by test methods specified in the MOU;
(C) The volume of other applicable quantity of the mitigation strategy used during each month;
(D) The blend rate of mitigation strategies used during each month, if applicable.

If the Executive Officer publishes notice that the effective ADF blend level has reached 75% of the significance threshold pursuant to section 2293.6(c)(2) and (3), any person subject to this provision shall report the information specified in (1)-(3) above for the affected ADF by the end of each month following the notice publication.

(3) For Stage 3B

A person operating within Stage 3B must submit monthly reports to the Executive Officer, with each reporting specifying the volume of ADF sold, supplied, or offered for sale in California during each month. In addition, the monthly reports shall contain results of a specified number of representative samples, for fuel properties by test methods specified in the MOU.

(c) Recordkeeping

(1) The producer shall maintain, for two years from the date of each sampling, records showing the sample date, product sampled, container or other vessel sampled, final blend volume, and the results of the fuel properties by the proscribed test methods.

Note: Authority cited: Sections 39600, 39601, 39667, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

§2293.9. Severability.

Each part of this subarticle shall be deemed severable, and in the event that any part of this subarticle is held to be invalid, the remainder of this subarticle shall continue in full force and effect.

Note: Authority cited: Sections 39600, 39601, 39667, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

Subarticle 3. Ancillary Provisions

§~~2293~~2294. Equivalent Test Methods.

* * * * *

Note: Authority cited: Sections 39600, 39601, 39667, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

§~~2293.5~~2295. Exemptions for Alternative Motor Vehicle Fuel Used in Test Programs.

The E~~e~~xecutive e~~O~~fficer shall consider and grant test program exemptions from the requirements of this Article in accordance with section 2259.

Note: Authority cited: Sections 39600, 39601, 39667, 43013, 43018, and 43101, Health and Safety Code; and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975). Reference: Sections 39000, 39001, 39002, 39003, 39010, 39500, 40000, 43000, 43016, 43018 and 43101, Health and Safety Code: and *Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District*, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

Appendix 1. Mitigation Measures.

A person subject to the Stage 3 mitigation requirements (section 2293.5(c)) may meet the mitigation requirement by implementing any of the following mitigation measures as applicable, either alone or in combination:

Additives approved for mitigation purposes, Low-NOx diesel (i.e., CARB diesel that has properties such that the pollutant that has triggered the significance level finding is already mitigated to the degree necessary to reduce the pollutant emissions below the significance level), an ADF-CARB diesel blend certified as emissions equivalent to CARB diesel or better, a neat ADF finished fuel certified as emissions equivalent to CARB diesel or better, or other options certified by the Executive Officer for this purpose.

(a) Biodiesel:

(1) Approved Emissions Equivalent Additives:

The following list shows the additive and required amounts as well as allowed blend level:

(A) Di-tert-butyl peroxide (DTBP): Biodiesel blends that contain DTBP by volume in the amounts specified in the table below are considered NOx mitigated. Any person who blends DTBP with a biodiesel blend in accordance with this report these volumes under the requirements of 2293.8, and whenever a report or record is made, the amount of biodiesel mitigated using each of the levels below must be included along with the actual amount of DTBP used.

Table A.5: DTBP Mitigation Blend Level

Biodiesel Blend Level	**Required level of DTBP**
B0 to <B10	0 ppm
B10 to <B15	≥0.75 percent
B15 to B20	≥1.0 percent
Above B20	Cannot be mitigated by DTBP alone

(B) [Reserved for Future Use]

(2) Low-NOx Diesel base fuel.
Hydrocarbon diesel fuel that meets the following specifications shall be considered Low-NOx diesel.

Table A.6: Low-NOx Diesel Fuel Parameters

Property	Test Method	Limit
Unadditized Cetane Number	ASTM D6890-13a	≥ 67
Total Aromatics	ASTM D5186-03(2009)	≤ 6.4 mass%
PAH	ASTM D5186-03(2009)	≤ 0.6 mass%
API Gravity	ASTM D287-12b	≥ 47.4 degrees API

Any biodiesel blend below B20 that was derived from at least 4.0 gallons of Low-NOx diesel for each gallon of biodiesel in the blend, will be considered NOx mitigated.

(3) Certification of Alternative Diesel Fuels Resulting in Emissions Equivalence with Diesel

(A) The Executive Officer, upon application of any producer or importer, may certify alternative diesel fuel formulations or additives in accordance with (a)(3) of this appendix. The applicant shall initially submit a proposed test protocol to the Executive Officer. The proposed test protocol shall include: (A) the identity of the entity proposed to conduct the tests described in (a)(3)(F) of this appendix; (B) test procedures consistent with the requirements of (a)(3) of this appendix; (C) test data showing that the fuel to be used as the reference fuel satisfies the specifications identified in (a)(3)(E) of this appendix; (D) reasonably adequate quality assurance and quality control procedures; and (E) notification of any outlier identification and exclusion procedure that will be used, and a demonstration that any such procedure meets generally accepted statistical principles.

Within 20 business days of receipt of a proposed test protocol, the Executive Officer shall advise the applicant in writing either that it is complete or that specified additional information is required to make it complete. Within 15 business days of submittal of additional information, the Executive Officer shall advise the applicant in writing either that the information submitted makes the proposed test protocol complete or that specified additional information is still required to make it complete. Within 20 business days after the proposed test protocol is deemed complete, the Executive Officer shall either approve the test protocol as consistent with this (a)(3) of this appendix or advise the applicant in writing of the changes necessary to make the test protocol consistent with (a)(3) of this appendix. Any notification of approval of the test protocol shall include the name, telephone number, and address of the Executive Officer's designee to receive notifications pursuant to (a)(3)(F)(iii)2. of this appendix. The tests shall not be conducted until the protocol is approved by the Executive Officer.

Upon completion of the tests, the applicant may submit an application for certification to the Executive Officer. The application shall include the approved test protocol, all of the test data, a copy of the complete test log prepared in accordance with (a)(3)(F)(iii)2. of this appendix, a demonstration that the candidate fuel meets the requirements for certification set forth in (a)(3) of this appendix, and such other information as the Executive Officer may reasonably require.

Within 20 business days of receipt of an application, the Executive Officer shall advise the applicant in writing either that it is complete or that specified additional information is required to make it complete. Within 15 business days of submittal of additional information, the Executive Officer shall advise the applicant in writing either that the information submitted makes the application complete or that specified additional information is still required to make it complete. Within 20 business days after the application is deemed complete, the Executive Officer shall grant or deny the application. Any denial shall be accompanied by a written statement of the reasons for denial.

(B) *The candidate fuel.*

The candidate fuel to be used in the comparative testing described in (a)(3)(F) of this appendix shall be one of the following:

1. ADF formulation: The candidate fuel shall be the fuel blendstock or fuel blend that the applicant is attempting to certify. If the applicant is attempting to certify a fuel blend, that blend shall consist of the fuel blendstock blended to 20 percent with the reference fuel. The applicant shall report all of the candidate fuel properties under (a)(3)(C) of this appendix for the candidate fuel.

2. Biodiesel additives: The candidate fuel shall be a mixture of the additive to be certified at the concentration specified by the applicant and the biodiesel additive certification fuel specified in (a)(3)(D) of this appendix. If the additive to be certified is meant to be used in B20 fuel blends, the candidate fuel shall be a mixture of the additive to be certified at the concentration specified by the applicant and the biodiesel additive certification fuel specified in (a)(3)(D) of this appendix blended to 20 volume percent biodiesel content with the reference fuel. The applicant shall report all of the candidate fuel properties under (a)(3)(C) of this appendix for both the certification fuel without the additive, and the candidate fuel.

(C) *Candidate fuel properties.*

The applicant shall report all of the properties of the candidate fuel listed below. The candidate fuel shall be representative of the fuel that the applicant will produce commercially, and shall not contain streams or feedstocks that will not be used in the commercial fuel that the applicant intends to sell. If the executive officer determines that the candidate fuel contains streams or feedstocks that will not be used in the commercial fuel, this will be grounds for rejection of the application.

Table A.7: Candidate fuel properties

Property	Test Method
Sulfur Content	ASTM D5453-93
Aromatic Hydrocarbon Content, Volume %	ASTM D5186-03(2009)
Polycyclic Aromatic Content, Weight %	ASTM D5186-03(2009)
Nitrogen Content	ASTM D4629-12
Unadditized Cetane Number	ASTM D613-10ae1
API Gravity	ASTM D287-12b
Viscosity at 40°C, cSt	ASTM D445-12
Flash Point, °F, minimum	ASTM D93-13
Distillation, °F	ASTM D86-12
Initial Boiling Point	
10 % Recovered	
50 % Recovered	
90 % Recovered	
End Point	
FAME Content %	EN14103:2011

(D) *Biodiesel additive certification fuel.* The biodiesel additive certification fuel shall be a biodiesel (fatty acid methyl ester) produced by transesterification of virgin soybean oil with the following properties.

Table A.8: Additive certification fuel blendstock properties

Property	Test Method	Fuel Specifications
Sulfur Content	ASTM D5453-93	15 ppm maximum
Nitrogen Content	ASTM D4629-12	10 ppm maximum
Unadditized Cetane Number	ASTM D613-10ae1	47-50
API Gravity	ASTM D287-12b	27 – 33
Viscosity at 40°C, cSt	ASTM D445-12	2.0 – 4.1
Flash Point, °F, minimum	ASTM D93-13	266
Distillation, °F	ASTM D86-12	
90 % Recovered		620-680
FAME Content %	EN 14103:2011	Report

(E) *The reference fuel.* The reference fuel used in the comparative testing described in (a)(3)(F) of this appendix shall be produced from straight-run California diesel fuel by a hydrodearomatization process and shall have the characteristics set forth below under "Reference Fuel Specifications" (the listed ASTM methods are incorporated herein by reference):

Table A.9: Reference Fuel Specifications

Property	**Test Method**	**Fuel Specifications**
Sulfur Content	ASTM D5453-93	15 ppm maximum
Aromatic Hydrocarbon Content, Volume %	ASTM D5186-03(2009)	10 % maximum
Polycyclic Aromatic Content, Weight %	ASTM D5186-03(2009)	10 % maximum
Nitrogen Content	ASTM D4629-12	10 ppm maximum
Unadditized Cetane Number	ASTM D613-10ae1	48 minimum
API Gravity	ASTM D287-12b	33 – 39
Viscosity at 40°C, cSt	ASTM D445-12	2.0 – 4.1
Flash Point, °F, minimum	ASTM D93-13	130
Distillation, °F	ASTM D86-12	
Initial Boiling Point		340 – 420
10 % Recovered		400 – 490
50 % Recovered		470 – 560
90 % Recovered		550 – 610
End Point		580 – 660

(F) *Emissions testing.*

1. Exhaust emission tests using the candidate fuel and the reference fuel shall be conducted in accordance with the "California Exhaust Emission Standards and Test Procedures for 1985 and

Subsequent Model Heavy-Duty Diesel-Powered Engines and Vehicles," as incorporated by reference in Title 13, California Code of Regulations, Section 1956.8(b). The tests shall be performed using a Detroit Diesel Corporation Series 60 engine, through December 31, 2017, or a 2004-2006 model-year, Cummins ISM370 engine having a nominal torque rating of 1450 ft-lb and a nominal power output of 360 to 380 hp, and produced between January 2004 and December 2006, inclusive, starting January 1, 2015, or, if the Executive Officer determines that the 2004-2006 Cummins ISM370 is no longer representative of the pre-2007 model-year, heavy duty diesel engine fleet, another engine found by the Executive Officer to be representative of such engines. A determination by the Executive Officer that an engine is no longer representative shall not affect the certification of a diesel fuel formulation based on prior tests using that engine pursuant to a protocol approved by the Executive Officer.

2. The comparative testing shall be conducted by a party or parties that are mutually agreed upon by the Executive Officer and the applicant. The applicant shall be responsible for all costs of the comparative testing.

3. The applicant shall use one of the following test sequences:

a. If both cold start and hot start exhaust emission tests are conducted, a minimum of five exhaust emission tests shall be performed on the engine with each fuel, using either of the following sequences, where "R" is the reference fuel and "C" is the candidate fuel: RC RC RC RC RC (and continuing in the same order). or RC CR RC CR RC (and continuing in the same order).

The engine mapping procedures and a conditioning transient cycle shall be conducted with the reference fuel before each cold start procedure using the reference fuel. The reference cycle used for the candidate fuel shall be the same cycle as that used for the fuel preceding it.

b. If only hot start exhaust emission tests are conducted, one of the following test sequences shall be used throughout the testing, where "R" is the reference fuel and "C" is the candidate fuel:

Alternative 1: RC CR RC CR (continuing in the same order for a given calendar day; a minimum of twenty individual exhaust

emission tests must be completed with each fuel)

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

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

For all alternatives, an equal number of tests shall be conducted using the reference fuel and the candidate fuel on any given calendar day. At the beginning of each calendar day, the sequence of testing shall begin with the fuel that was tested at the end of the preceding day. The engine mapping procedures and a conditioning transient cycle shall be conducted after every fuel change and/or at the beginning of each day. The reference cycle generated from the reference fuel for the first test shall be used for all subsequent tests.

For alternatives 2 and 3, each paired or triplicate series of individual tests shall be averaged to obtain a single value which would be used in the calculations conducted pursuant to (a)(3)(G)(iii) of this appendix.

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

unscheduled interruption resulting in a test delay of 48 hours or more, and of the reason for such delay. Prior to restarting the test, the applicant or person conducting the tests shall provide the Executive Officer with a revised schedule for the remaining tests. All tests conducted in accordance with the test schedule, other than any tests rejected in accordance with an outlier identification and exclusion procedure included in the approved test protocol, shall be included in the comparison of emissions pursuant to (a)(3)(G) of this appendix.

5. In each test of a fuel, exhaust emissions of oxides of nitrogen (NOx) and particulate matter (PM) shall be measured.

(G) The average emissions during testing with the candidate fuel shall be compared to the average emissions during testing with the reference fuel, applying one-sided Student's t statistics as set forth in Snedecor and Cochran, *Statistical Methods* (7th ed.), page 91, Iowa State University Press, 1980, which is incorporated herein by reference. The Executive Officer shall issue a certification pursuant to this paragraph only if he or she makes all of the determinations set forth in (a)(3)(G)(i) and (a)(3)(G)(ii) below, after applying the criteria of (a)(3)(G)(iii) of this appendix.

1. The average individual emissions of NOx and PM, respectively, during testing with the candidate fuel do not exceed the average individual emissions of NOx and PM, respectively, during testing with the reference fuel.

2. Use of any additive identified pursuant to (a)(3)(b)(ii) of this appendix in heavy-duty engines will not increase emissions of noxious or toxic substances which would not be emitted by such engines operating without the additive. In addition, cellular tests on the particulate emissions from heavy-duty engines will not show greater harm for mutagenicity, inflammation, DNA damage, or oxidative stress with the use of any such additive than would occur with such engines operating without the additive.

3. In order for the determinations of (a)(3)(G)(i) of this appendix to be made, for each referenced pollutant the candidate fuel shall satisfy the following relationship:

$$\overline{x_C} < \overline{x_R} + \delta - S_P \times \sqrt{\frac{2}{n}} \times t(a, 2n-2)$$

Where:

$\bar{X}_C$ =	Average emissions during testing with the candidate fuel
$\bar{X}_R$ =	Average emissions during testing with the reference fuel
δ =	tolerance level equal to 1 percent of $\bar{X}_R$ NOx, 2 percent of $\bar{X}_R$ for PM.
S_p =	Pooled standard deviation
t (a, 2n-2) =	The one-sided upper percentage point of t distribution with a = 0.15 and 2n-2 degrees of freedom
n =	Number of tests of candidate and reference fuel

(H) If the Executive Officer finds that a candidate fuel has been properly tested in accordance with (a)(3) of this appendix, and makes the determinations specified in (a)(3)(G) of this appendix, then he or she shall issue an Executive Order certifying the alternative diesel fuel or additive formulation represented by the candidate fuel. The Executive Order shall identify all of the characteristics of the candidate fuel determined pursuant to (a)(3)(C) of this appendix. The Executive Order shall provide that the certified alternative diesel fuel formulation has the following specifications: [1] a sulfur content, total aromatic hydrocarbon content, polycyclic aromatic hydrocarbon content, and nitrogen content not exceeding that of the candidate fuel, [2] a cetane number and API gravity not less than that of the candidate fuel, [3] any additional fuel specification required under (a)(3) of this appendix, and [4] presence of all additives that were contained in the candidate fuel, in a concentration not less than in the candidate fuel, except for an additive demonstrated by the applicant to have the sole effect of increasing cetane number. Additionally the Executive Order shall contain a table mirroring the table in Appendix 1 (a)(1)(A) listing the required concentration of additive at each 5 percent interval of blend level, if applicable. All such characteristics shall be determined in accordance with the test methods identified in (a)(3)(C) of this

appendix. The Executive Order shall assign an identification name to the specific certified biodiesel fuel formulation.

(I) *In-use testing.*

1. If the executive officer determines that a commercially available biodiesel fuel blend meets all of the specifications of a certified biodiesel fuel formulation set forth in an Executive Order issued pursuant to (a)(3)(H) of this appendix, but does not meet the criteria of (a)(3)(G) of this appendix when tested in accordance with (a)(3)(F), the Executive Officer shall modify the Executive Order as is necessary to assure that biodiesel fuel blends sold commercially pursuant to the certification will meet the criteria set forth in (a)(3)(G). The modifications to the order may include additional specifications or conditions, or a provision making the order inapplicable to specified biodiesel fuel producers.

2. The Executive Officer shall not modify a prior Executive Order without the consent of the applicant and of the producer of the commercially available biodiesel fuel blend found not to meet the criteria, unless the applicant and producer are first afforded an opportunity for a hearing in accordance with Title 17, California Code of Regulations, Part III, Chapter 1, Subchapter 1, Article 4 (commencing with Section 60040). If the Executive Officer determines that a producer would be unable to comply with this regulation as a direct result of an order modification pursuant to this subsection, the Executive Officer may delay the effective date of such modification for such period of time as is necessary to permit the producer to come into compliance in the exercise of all reasonable diligence.

(b) [Reserved]

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Appendix B

Technology Assessment

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Appendix B. TECHNOLOGY ASSESSMENT

A. Literature Search

Multiple studies have looked at the impact of biodiesel on heavy-duty diesel vehicle NOx emissions. The National Renewable Energy Lab (NREL) and the U.S. EPA have both examined the literature to determine these effects. Neither of these databases focused primarily on the effects of using CARB diesel as the base fuel. To fill this knowledge gap, ARB staff conducted a literature search that addresses the impacts of biodiesel use on NOx emissions in heavy duty engines using California diesel as the base fuel.

The literature search focused on biodiesel blends B20 and below and characterized studies by their baseline fuel properties. Studies that used either explicitly CARB diesel or a diesel fuel that was tested to have a cetane number of at least 49 were included in the analysis. The studies included in this analysis were all performed using engine dynamometer with commercially available engines, and no engine modifications. Studies using test cycles based on a single speed and mode were excluded from this analysis.

Based on this literature search staff performed an analysis to determine what the overall effects of biodiesel on NOx at different blends were. Each set of tests in a study using the same engine and test cycle were considered to be an individual data point, and each of these data points were weighted equally. Table B.1 shows the results of the analysis completed by staff. In general, the literature shows that NOx emissions from soy-based biodiesel are greater than NOx emissions from animal-based biodiesel, and the NOx increase is pronounced in blends that use a high cetane base fuel more so than in blends using a lower cetane base fuel.

Table B.1: NOx Impacts of Biodiesel in Heavy Duty Engines

	High-Cetane Base fuel (≥49)	Low-Cetane Base fuel (<49)
B5 all feedstock	+0.3%	-1.3%
B5 soy	+0.4 %	+0.7 %*
B5 animal	+0.2 %	-2.7 %
B10 soy	+2.7%	+0.2%
B20 all feedstock	+3.2%	+1.5 %
B20 soy	+3.9%	+1.8 %
B20 animal	+1.8 %	+ 0.0 %

* This number is based on one study.

Below is a list of all the studies that were included in the high cetane literature search analysis.

Table B.2: List of Studies from High Cetane Literature Search

Author	Title	Published	Year
Durbin	Biodiesel Characterization and NOx Mitigation Study	Final Report Prepared for Robert Okamoto, M.S. and Alexander Mitchell, CARB	2011
Clark	Transient Emissions Comparisons of Alternative Compression Ignition Fuel	SAE 1999-01-1117	1999
Eckerle	Effects of Methyl Ester Biodiesel Blends on NOx Emissions	SAE 2008-01-0078	2008
McCormick	Fuel Additive and Blending Approaches to Reducing NOx Emissions from Biodiesel	SAE 2002-01-1658	2002
McCormick	Regulated Emissions from Biodiesel Tested in Heavy-Duty Engines Meeting 2004 Emissions	SAE 2005-01-2200	2005
Nuszkowski	Evaluation of the NOx emissions from heavy duty diesel engines with the addition of cetane improvers.	Proc. I Mech E Vol. 223 Part D: J. Automobile Engineering, 223, 1049-1060	2009
Thompson	Neat fuel influence on biodiesel blend emissions	Int J Engine Res Vol. 11, 61-77.	2010

Below, Figures B.1, B.2, and B.3 show all of the data points considered in Staff's literature search as they relate to NOx. These graphs show the impacts from all data, from those data using soy biodiesel, and from those data using animal biodiesel. As is shown from the linear interpolation of soy and animal biodiesel trends, soy biodiesel emits about 2.2 times as much NOx as animal biodiesel.

Figure B.1: NOx Impact of Biodiesel Blended in High Cetane Base Fuel

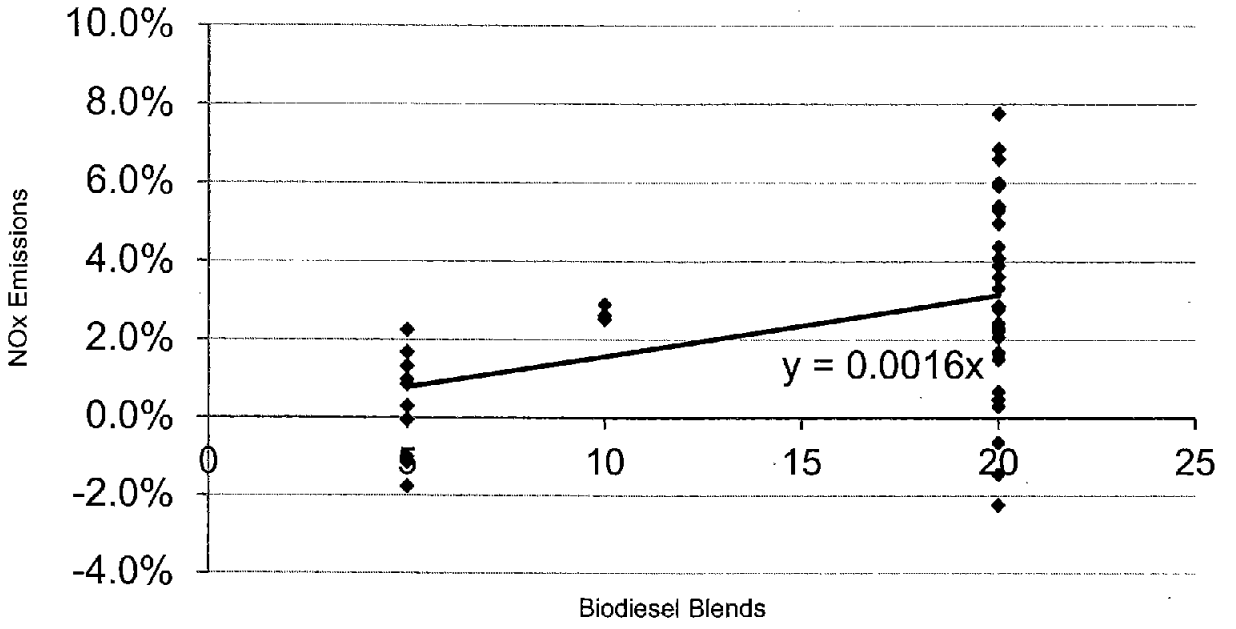


Figure B.2: NOx Impact of Soy Biodiesel Blended in High Cetane Base Fuel

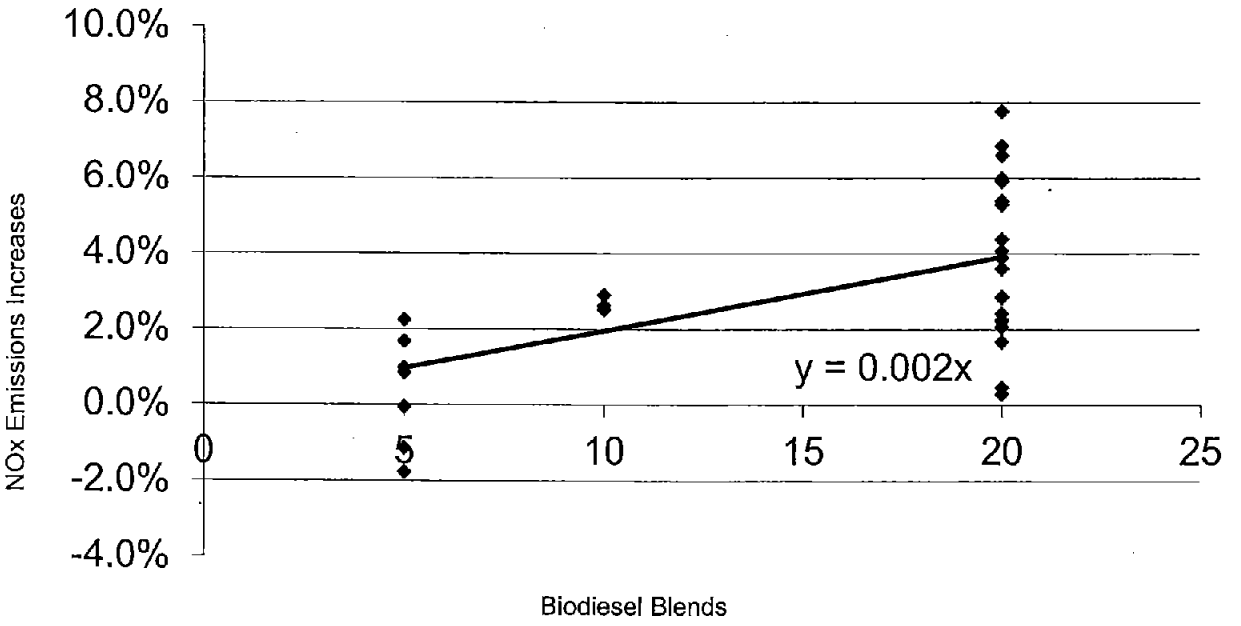
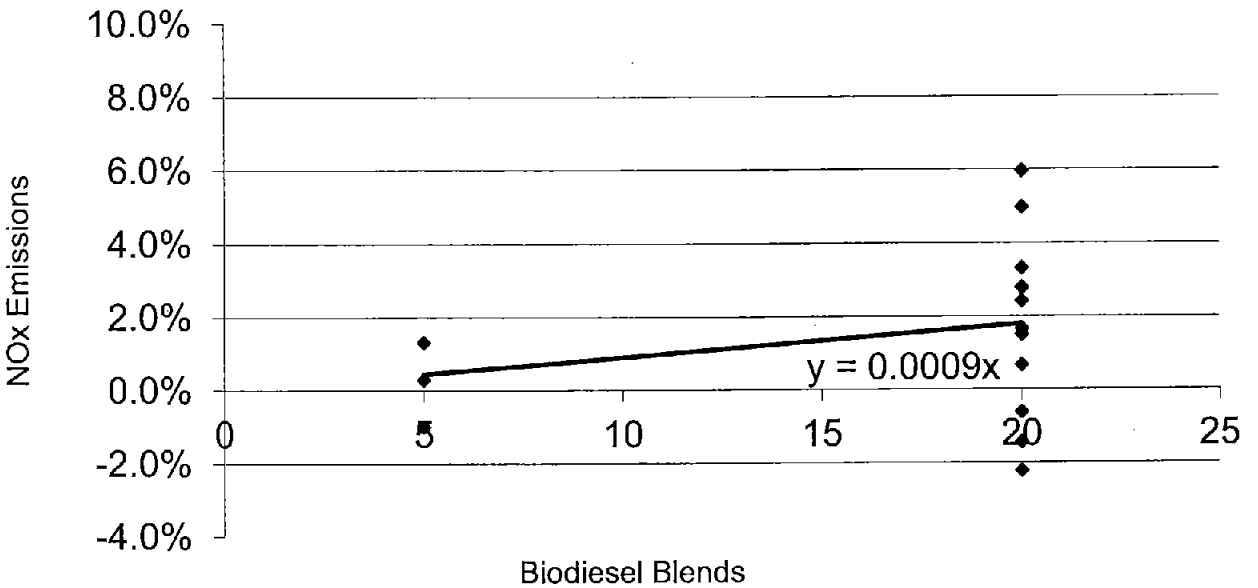


Figure B.3: NOx Impact of Animal Biodiesel Blended in High Cetane Base Fuel



B. Explanation of Factors in Biodiesel Effective Blend Level Calculation

Below is the formula that is used to calculate the effective blend level of biodiesel, when determining whether the significance level for NOx has been reached.

Equation __. Biodiesel Effective Blend Level Formula

$$EB = 100 \times \left[\frac{NBV - 0.5LN - 0.73RD - VM - 0.55AB}{TCV}\right]$$

Where,

EB = effective ADF blend level, expressed as percent biodiesel
NBV = net volume of biodiesel used in compression-ignition engines in California, excluding gallons used as B5 or less, expressed in gallons
LN = volume of low-NOx diesel used in compression-ignition engines in California, excluding renewable diesel, expressed in gallons
RD = volume of renewable diesel used in compression-ignition engines in California, expressed in gallons
BM = volume of biodiesel, employing one of the mitigation strategies specified in Appendix 1 prior to the date mitigation is required under 2293.5(c)(4), used in compression-ignition engines in California, expressed in gallons

AB = volume of animal-fats-based biodiesel used in compression-ignition engines in California, expressed in gallons

TCV = total volume of all fuels used in compression-ignition engines in California (not including any fuel with a specification under 13 CCR 2292), expressed in gallons

The factor 0.5 for the term LN is derived from the ratio of 4 to 1 required of LN to fully mitigate NOx from biodiesel. This ratio is reduced to 2 to 1 to mitigate the NOx down to B10 from B20, so every gallon of LN diesel mitigates 0.5 gallons of biodiesel. The factor of 0.73 for the term RD is derived from mitigation testing that showed that 2.75 gallons of renewable diesel mitigated 1 gallon of biodiesel NOx. This ratio is reduced to 1.375 to 1 to mitigate the NOx down to B10 from B20, so 1 gallon of renewable diesel mitigates 0.73 gallons of biodiesel NOx. The ratio of 0.55 for the term AB is derived from the relationship that soy biodiesel emits about 2.2 times more NOx than animal biodiesel. Therefore if we expect most biodiesel to be soy based, using 1 gallon of animal biodiesel reduces the expected NOx increase by 0.55 gallons.

C. Staff Projection of Fuels Impacting Biodiesel Effective Blend Level Calculation

The table below shows staff's projections for fuels that are relevant to the calculation of effective blend level for biodiesel. The mitigation trigger is 95 percent of the significance threshold for biodiesel in all years. The BD volume is staff's projection of biodiesel consumption in California, in million gallons, based on other organization projections and data on past biodiesel volumes. BD content is the BD volume as a portion of total diesel. Total diesel is the total diesel used and high case projected diesel consumption, in million gallons, contained in the CEC's 2011 Integrated Energy Policy Report. Animal BD is staff's projection of the amount of biodiesel consumed that is from animal feedstocks, in million gallons, based on current levels in the Low Carbon Fuel Standard Reporting Tool of 10 percent of total biodiesel. BD portion sold as B5 is based on current B5 content of 90 percent[37] continuing until total biodiesel is above B5, then declining over time. RD Volume is staff's projection of the volume of renewable diesel consumed in California, in million gallons, based on 50 percent of current production volumes being used in California by 2020. RD to BD ratio is the volume of Low NOx diesel divided by total biodiesel minus biodiesel sold as B5. Min RD to BD is the ratio of renewable diesel to biodiesel that will guarantee no increases in NOx, which is 1.375. EM is the percentage of the total California heavy-duty diesel fleet that is expected to be New Technology Diesel Engines, according to EMFAC 2007. Effective Blend is the blend level of biodiesel as calculated using the equation in proposed section 2293.6, assuming that LN and VM are each zero.

[37] Based on a phone communication with Mr. Russ Kinzig, Kinder Morgan, October 4, 2013.

Table B.3: Fuel Projections

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Mitigation trigger	9.5%	9.5%	9.5%	9.5%	9.5%	9.5%	9.5%	9.5%	9.5%	9.5%	9.5%	9.5%	9.5%	9.5%
BD Volume (MMG)	5	11	18	40	80	120	175	219	264	310	350	380	410	440
BD Content %	0.2%	0.3%	0.5%	1.2%	2.3%	3.3%	4.8%	5.9%	7.0%	8.2%	9.1%	9.7%	10.4%	11.0%
Total Diesel (MMG)	3295	3280	3340	3410	3510	3590	3650	3700	3760	3800	3850	3900	3950	4000
Animal BD (MMG)	0.5	1.1	1.8	4.0	8.0	12.0	17.5	21.9	26.4	31.0	35.0	38.0	41.0	44.0
BD portion sold as B5	90%	90%	90%	90%	90%	90%	90%	80%	70%	60%	50%	45%	40%	35%
RD Volume (MMG)	0	0	1	50	65	85	100	154	209	263	317	350	400	450
RD to BD ratio	0.0	0.0	0.6	4.3	3.8	5.4	5.7	3.5	2.6	2.1	1.8	1.7	1.6	1.6
Min RD to BD	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
EM	5%	10%	15%	20%	26%	36%	45%	50%	55%	59%	67%	76%	82%	94%
Effective Blend	0.0%	0.0%	0.0%	-1.0%	-1.1%	-1.4%	-1.5%	-1.9%	-2.0%	-1.9%	-1.7%	-1.5%	-1.5%	-1.4%

Appendix C

Staff Estimate of the Cost of Biodiesel NOx Mitigation

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Appendix C
Staff Estimate of the Cost of Biodiesel NOx Mitigation

Introduction:

Based on staff's proposals, biodiesel NOx mitigation would be required once the statewide effective blend level reaches the significance threshold trigger. This level corresponds to about a B10 (i.e. ten volume percent biodiesel) statewide average. California consumption of diesel fuel is currently about 3.5 billion gallons annually, so at the effective blend level of B10, the corresponding volume of biodiesel that would trigger the need for mitigation would be 350 million gallons.

As pointed out in the initial statement of reasons (i.e., Staff Report) technology chapter V, staff has found that that there is an increase in NOx emissions of about four percent relative to a B20 blend of soy biodiesel with CARB diesel.

The ARB sponsored study, ***Biodiesel Characterization and NOx Mitigation Study (2011)***, resulted in the identification of potential options to mitigate the NOx increases for biodiesel fuel use. These options include:

- Use of approved NOx control additives;
- Use of a certified ADF (i.e., biodiesel) formulation; or
- Blending biodiesel with Low-NOx diesel fuels.

Staff assessed the cost of each compliance option for mitigating NOx from biodiesel blends.

1. Use of Approved NOx Control Additives

To determine the costs of compliance using approved NOx control additives, staff estimated the cost of using di-tert butyl peroxide (DTBP) at a treat rate of one percent by mass for all biodiesel produced for California. Staff assumed that for widespread additive use, fuel terminals would be best suited to provide the ability to inject the additive for all biodiesel production, due to higher throughput, economy of scale and resulting lower costs. In 1992, ARB implemented the gasoline deposit control additive regulation (title 13 CCR section 2257), which requires all gasoline in California to contain additives, similarly to DTBP in biodiesel. As a result, virtually all gasoline deposit control additives are currently injected into gasoline at the terminal level.

Staff estimated the cost of additive NOx mitigation based on the cumulative cost of new wide scale infrastructure (including the cost of operation) and the cost of the DTBP additive.

a. *Infrastructure, Operations and Maintenance Costs:*

Staff received an estimate from Kinder Morgan, the largest California terminal company, to design, build and operate a large new additive injection facility to the scale required to treat all biodiesel production. Kinder Morgan indicated that additive equipment would be necessary both at their Fresno terminal and their Colton terminal. Kinder Morgan estimated a total capital cost of about $6.8 million for both of their facilities and corresponding to a maximum throughput of 7.2 million gallons of B100 per year (i.e., 100,000 gal/day per facility). This includes the cost of offsite construction, equipment costs, equipment installation costs and start-up costs. In addition to infrastructure cost, Kinder Morgan also provided an estimate of $40,000 for the annual cost of operations and maintenance. These costs reflected the cost to operate the DTBP additive injection equipment as well as on-going maintenance and repair.

To calculate total annualized capital cost, staff utilized the following capital recovery factor: CRF =Interest rate / [1-(1+interest rate)$^{-\text{years of loan}}$]

Therefore, for a ten year amortization at a five percent loan interest rate, the capital recovery factor is: CRF_{10}= 0.05 / [1-(1.05)$^{-10}$] = 0.1295,

Using the capital recovery factor the annual cost of capital is:
Annual Capital Cost=Total Capital Cost x CRF10, or
$6,800,000 x 0.1295= $880,600/year

Together with the operations and maintenance costs, the total annual cost to provide additive at two Kinder Morgan facilities would be: $880,600 + $40,000=$920,600

Likewise, if the two Kinder Morgan facilities treat biodiesel with DTBP at the one percent treat rate and if Kinder Morgan treats 3.6 million gallons of biodiesel per year, then the incremental cost of adding additive to biodiesel will be $920,600/7,200,000 gallons per year, or $0.12/gal.

b. Additive Cost:

To determine the cost of the DTBP additive, staff solicited quotes from several chemical production companies, but found that for the quantities needed, DTBP pricing were based on bulk volumes. Staff received a bulk volume quote of $3.45 for every 10 metric tons purchased and delivered to California[38]. Using conversion factors and DTBE density to calculate the cost per gallon, we get:
$3.45/kg x 0.79 kg/L x 3.7854 L/gal = $10.32/gal DTBP.
To add DTBP at one volume percent to 350,000,000 gallons of biodiesel, then 3,500,000 gallons of DTBP (i.e., 350,000,000 gal x 0.01) would be required for a total annual additive cost of:
3,500,000 gallons DTBP x $10.32/gallon DTBP= $36,120,000.

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[38] Email from Karl Wang, Orchid Chemical

Therefore, the additive cost on a per gallon basis to treat 350,000,000 gallons of biodiesel will result in:
$36,120,000/350,000,000gallons= $0.10/gallon biodiesel treated.

This cost achieves full NOx mitigation of blends up to B20. Therefore:
Total cost of adding DTBP to biodiesel = Cost of Injection/gal + Cost of Additive/gal, or
= $0.12/gal + $0.10/gal
= $0.22/gal.

2. Use of a Certified Biodiesel Blend Formulation

This mitigation option is being proposed by staff and is modeled after the existing certification program contained in the California diesel fuel regulation under title 13 CCR section 2282(g). In the proposed certification program, a prescribed engine test protocol is followed for a candidate biodiesel blend fuel to derive emissions data and that data is compared to emissions data derived using the same test protocol on a conventional diesel reference fuel. Based on a statistical evaluation of the data, staff could determine if the candidate biodiesel blend demonstrates the same emissions performance as the conventional diesel reference fuel. If the statistical criteria is met, then the candidate biodiesel blend would achieve NOx mitigation and thereby be deemed a certified biodiesel blend.

Given the highly confidential and competitive nature of certifying specific fuel formulations, it is likely that all individual biodiesel producers may need to obtain their own individual certification to optimize their particular biodiesel blend formulations. The notable exception may be the case in which a trade association obtains a certification which subsequently is made available to their membership. However, for purposes of this analysis staff assumed that all 22 biodiesel producers listed in Table 10.7 would need to incur the cost of certification. Furthermore, there may be additional production costs associated with certified biodiesel blends such as in the case of designer blends using combinations of Low-NOx diesel, additives and specialized biodiesel feedstocks. However, it is impossible for staff to predict these costs.

Staff concludes that the cost of this mitigation option would be similar to previous certifications completed under 13 CCR Section 2282(g). Historically, the cost of certification has ranged between 100,000 and 300,000 dollars. Any costs incurred during the research and development (R&D) of the candidate fuel was not factored into the cost analysis for this compliance option. Those R&D costs were attributed to the normal operating business practices of emerging industries. Therefore, based on the upper end of the range of certification cost, the total cost for 22 biodiesel producers would be $6,600,000. If no additional production costs apply to certified biodiesel blends, then the cost of certifying 200,000,000 gallons of biodiesel is $6,600,000/200,000,000 gallons of biodiesel, or $0.03/gallon. This cost does not account for any incremental production cost of meeting the certified formation specification.

3. Cost to Use Low-NOx Diesel

The third compliance option identified by staff to mitigate NOx emissions from biodiesel blends involves the use of Low-NOx diesel blendstocks. Previous studies have demonstrated that the use of renewable diesel fuel, or other high cetane renewable fuels like gas to liquid or Fischer-Tropsch fuels, is effective in mitigating NOx emissions associated with biodiesel blends. Studies show that to mitigate the NOx effect of a B20 blend, producers would need to use a ratio of 4:1, of renewable diesel to CARB diesel for the non-biodiesel portion of the blend.

Renewable diesel is available in today's market either as an imported product, or from production in a refinery. To date, Kern Oil in Bakersfield is one the few California refiners who provide limited quantities of renewable diesel.

Due to economic incentives on renewable diesel stemming from credits under the low carbon fuel standard and renewable identification numbers from the renewable fuel standard, in addition to a blender's tax credit, the cost of renewable diesel in California is relatively low priced today and competitive with CARB diesel. Currently, Neste Oil imports renewable diesel into California because current global market conditions favor these imports. While this may suggest a low cost option of NOx mitigation, the quantities are very low relative to the volume needed to mitigate biodiesel if it should be required.

Because California is still under a statewide B1 level, staff anticipates that mitigation will not be required for several years (if at all), and is likely that current global market conditions will change and not remain sustainable at today's renewable diesel fuel prices. This is especially true as renewable diesel production volume ramps up to meet the higher demands of the LCFS requirements. Current reporting under the LCFS, indicates that 7 million gallons of renewable diesel fuel were produced this year with an estimated 20 million gallons being produced by the end of 2013. This represents only a small fraction of the volume required to mitigate the volume corresponding to meeting the trigger level at B10. To meet the renewable diesel fuel demand for potential mitigation and LCFS, staff believes that a more sustainable source of renewable diesel would be required suggesting the need for domestic production.

Determining the cost of producing renewable diesel in a refinery is highly complex since actual costs depend on a large number of parameters, including feedstock costs, refinery process modifications, its use to produce a lower carbon intensive CARB diesel fuel, etc. An initial estimate of the incremental price of domestically produced renewable diesel would account for the difference in feedstock costs, assuming a refinery could process either crude or renewable diesel feedstocks such as animal tallow, waste vegetable oil, algae, etc. In this case, the incremental cost of renewable diesel feedstocks are about $0.30 per gallon higher than crude feedstocks. So, all things being equal, the incremental cost of purchasing renewable diesel would be at least $0.30 per gallon and since studies show that it takes four gallons of renewable diesel to mitigate the NOx impact of one gallon of biodiesel. Therefore, the overall cost

of mitigation based on feedstocks alone would be $1.20 per gallon of mitigated biodiesel.

CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC MEETING TO CONSIDER THE APPROVAL OF THE DRAFT REPORT: PROPOSED RESEARCH PLAN, FISCAL YEAR 2014-2015

The Air Resources Board (ARB or Board) will conduct a public meeting at the time and place noted below to consider the approval of the *"Proposed Research Plan, Fiscal Year 2014-2015"*

DATE: December 12, 2013

TIME: 9:00 a.m.

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

This item may be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., December 12, 2013, and may continue at 9:00 a.m. on December 13, 2013. This item may not be considered until December 13, 2013. Please consult the agenda for the meeting, which will be available at least 10 days before December 12, 2013, to determine the day on which this item will be considered.

The California Health and Safety Code (HSC), sections 39700-39705, established the Air Resources Board's research program. It directed the Board to coordinate and administer all air pollution research that is funded, to any extent, with State funds. To facilitate this process, HSC section 39705 directs the Board to appoint a Research Screening Committee to give advice and recommendations on all air pollution research projects proposed for funding.

ARB staff will present a written draft report, *Proposed Research Plan, Fiscal Year 2014-2015*, at the meeting. The report describes proposed research concepts for funding. After the staff presentation and public testimony, the Board will vote on the draft plan. Those research concepts approved by the Board at this meeting will be developed into full research proposals, submitted to the Research Screening Committee for their advice and recommendations, and brought back to the Board for final consideration and approval.

Copies of the report may be obtained from ARB's Public Information Office, 1001 I Street, First Floor, Environmental Services Center, Sacramento, California, 95814, (916) 322-2990, December 2, 2013, at least 10 days prior to the scheduled meeting. The report may also be obtained from ARB's website at http://www.arb.ca.gov/research/apr/apr.htm.

Interested members of the public may present comments orally or in writing at the meeting and may provide comments by postal mail or by electronic submittal before the meeting. To be considered by the Board, written comments not physically submitted at the meeting, must be received **no later than 12:00 noon on December 11, 2013,** and addressed to the following:

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

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

You can sign up online in advance to speak at the Board meeting when you submit an electronic board item comment. For more information go to: http://www.arb.ca.gov/board/online-signup.htm.

Please note that under the California Public Records Act (Government Code section 6250 et seq.), your written and verbal comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request.

ARB requests that written and email statements on this item be filed at least 10 days prior to the meeting so that ARB staff and Board members have sufficient time to consider each comment. Further inquiries regarding this matter should be directed to Sarah Pittiglio, Air Pollution Specialist, (916) 324-0627, or Annmarie Rodgers, Manager of the Climate Action and Research Planning Section, (916) 323-1517.

SPECIAL ACCOMMODATION REQUEST

Consistent with California Government Code Section 7296.2, special accommodation or language needs can be provided for any of the following:

- An interpreter to be available at the hearing;
- Documents made available in an alternate format or another language; and/or
- A disability-related reasonable accommodation.

To request these special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by facsimile at (916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled Board hearing. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

Comodidad especial o necesidad de otro idioma puede ser proveído para alguna de las siguientes:

- Un intérprete que esté disponible en la audiencia;
- Documentos disponibles en un formato alterno u otro idioma; y/o
- Una acomodación razonable relacionados con una incapacidad.

Para solicitar estas comodidades especiales o necesidades de otro idioma, por favor llame a la oficina del Consejo al (916) 322-5594 o envíe un fax a (916) 322-3928 lo más pronto posible, pero no menos de 10 días de trabajo antes del día programado para la audiencia del Consejo. TTY/TDD/Personas que necesiten este servicio pueden marcar el 711 para el Servicio de Retransmisión de Mensajes de California.

CALIFORNIA AIR RESOURCES BOARD

Richard W. Corey
Executive Officer

Date: November 12, 2003

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website at www.arb.ca.gov.

Proposed Research Plan

Fiscal Year 2014-15



December 2013

California Environmental Protection Agency

Air Resources Board

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INTRODUCTION

The goal of ARB's research program is to provide timely scientific and technical information to help the Board, local air districts, and others take effective actions to improve air quality and meet greenhouse gas reduction goals. ARB's research on the health effects of air pollution focuses on emerging issues of importance to California communities. Improving the understanding of transportation-related air pollution exposures continues to be a high priority. The climate change research program supports the development of greenhouse gas mitigation strategies, and investigates the societal impacts of actions taken.

ARB's research program will continue to play an important role in meeting the challenges of increasingly stringent federal air quality standards and long-term climate goals. California is planning for the future by assessing what it will take to meet federal deadlines for national air ambient air quality standards (NAAQS), reducing community health risk from air pollution, and meeting greenhouse gas reduction goals in 2020 and beyond. The projects outlined in this Plan will provide essential data and tools to support action to meet these climate and air quality goals. The projects are designed to provide answers to near-term questions that are important for program implementation and to explore the benefits of longer-term strategies.

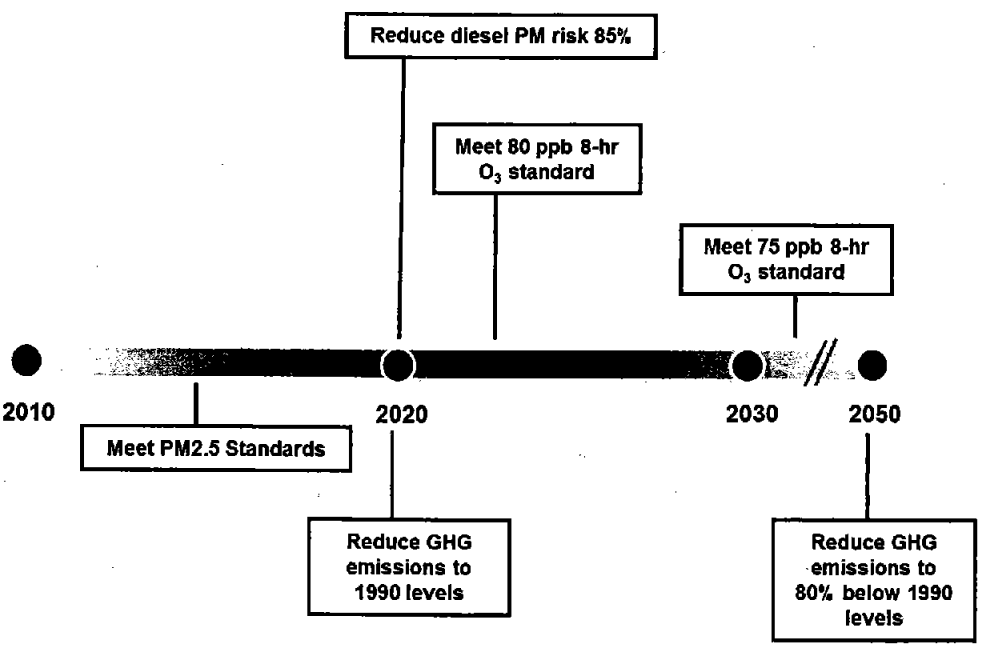


Figure 1. California's key air quality and climate change milestones through 2050.

The Fiscal Year 2014-15 Research Plan includes 14 research concepts, requiring approximately $5.3 million in funding. As shown in Figure 2, funding is allocated to research related to health (33%), air quality (30%), and climate change (37%).

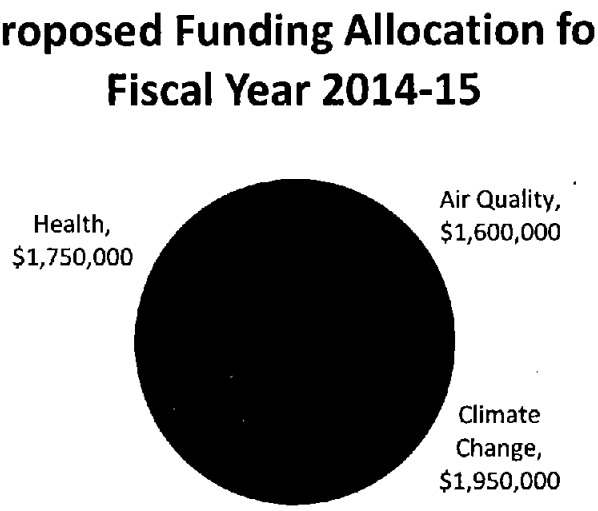


Figure 2. Proposed ARB research funding allocation for Fiscal Year 2014-15.

PLANNING PROCESS

This research plan is designed to address the Board's highest priority program needs. The strategic planning process used to develop the Annual Research Plan begins with feedback from ARB program staff on the Board's regulatory priorities and challenges. Both near-term and longer-term needs are assessed. Project ideas are also solicited through an online public submission process. Projects are then developed through extensive discussions with ARB program staff and experts from research institutions and other State and federal agencies. Projects are carefully reviewed by ARB staff and the Research Screening Committee for scientific rigor, policy relevance, and strong links to ARB's programs and mission. A proposed Plan is presented to the Board and, if approved, full research proposals are developed through a solicitation which recognizes the academic assets of the University of California and California State University systems. Draft proposals are evaluated by technical review teams that include partners from federal and other State agencies as well as air districts. The developed projects are then brought back to the RSC and the Board to request approval for funding of each project.

COORDINATION, LEVERAGING, AND COLLABORATION

Research coordination with other State agencies, federal agencies, air districts, and research institutions is also an important aspect of outreach in order to avoid duplication of effort, to leverage funding, to identify opportunities for collaborative efforts, and to maximize the utility of research results. ARB staff seeks co-funding opportunities and explores other ways to leverage limited research dollars. This process enables ARB to participate in projects and studies outside the reach of ARB's research budget alone; recent examples of this type of collaboration include ARB's involvement with the Air

Quality Applied Sciences Team (National Aeronautics and Space Administration [NASA]) and the Los Angeles Megacities project (funded by the National Institute of Standards and Technology [NIST]).

To promote coordination, information is shared at all stages of the research process, from project development to updates on research progress and final reports. Other activities include participation in interagency groups, such as the Climate Action Team (CAT) Research Working Group and the Transportation Research Roundup. In the development of the research topics included in this plan, ARB staff coordinated with numerous State and federal agencies and partners, including federal agencies spanning the United States Environmental Protection Agency (U.S. EPA), the Department of Energy, the Department of Transportation, the National Highway Traffic Safety Administration, the National Institute of Environmental Health Sciences; other State agencies including the Governor's Office of Planning and Research, the California Energy and Public Utilities Commissions, the California Department of Transportation (Caltrans), the Office of Environmental Health Hazard Assessment, Housing and Community Development, the Strategic Growth Council; and local air districts and non-governmental organizations such as the Health Effects Institute (HEI) and the Coordinating Research Council. Example areas of interagency research collaboration include agricultural emissions, zero emission vehicles, and alternative fuels.

ARB staff communicates new research results to the public through seminars, press releases, final reports, and updates at Board Meetings. ARB staff also co-sponsor workshops with other State agencies on a variety of research topics. The workshops provide a public setting for researchers funded by multiple State agencies to showcase their efforts, provide an opportunity for an in-depth discussion of the implications of their results, and identify remaining research gaps.

Current Research

ARB research projects are currently investigating a number of established and emerging health-related issues. One example is the issue of multi-pollutant exposures, which are typical for ambient air. Single pollutant studies have been essential to the process of establishing health protective levels for NAAQS. Understanding how concurrent exposure to ozone and PM2.5 may affect public health is the focus of a FY 2013-14 research project now underway.

The research program continues to quantify the degree to which vulnerable groups are more sensitive to air pollution impacts and is exploring new ways to study vulnerability, such as examining the impact of genetic variability on health in populations exposed to different sources of air pollution. For example, a current ARB-funded study of elderly subjects with cardiovascular disease in Los Angeles is designed to provide information on the effects of air pollution exposures from difference sources on the expression of genes related to the pathophysiological mechanisms of PM2.5. The results will be available in the spring of 2014.

Near-roadway and ultrafine particulate matter (UFPM) exposures continue to be research priorities. A study with rodents that was completed earlier this year investigated the cardiovascular effects from exposure to UFPM. The study results showed that the organic constituents of UFPM contribute to the development of atherosclerotic plaques in the arteries. A current study of asthmatic children is examining the impacts of primary and secondary organic aerosols to determine the relationship of these components of PM2.5, including UFPM, to asthma exacerbations. Another study is evaluating the impacts of sound wall/vegetation combinations on downwind levels of traffic-related pollution including PM2.5, ultrafine particles, black carbon, and oxides of nitrogen. These studies will shed light on toxicity and mechanistic pathways and potentially useful mitigation measures that can be developed to reduce roadway exposures. Results from these research projects are expected in 2015 and 2016.

To support ARB's environmental justice policies, researchers are updating, automating, and expanding the ARB funded Environmental Justice Screening Method (EJSM) to cover the entire State. Use of the most current data sets will allow provide for better capture patterns of cumulative impact and vulnerability of importance to environmental justice communities Statewide. This effort will enhance the understanding of the geographic patterns of cumulative impacts and vulnerability, including data limitations and gaps, and will provide valuable information to support environmental justice programs, initiatives, and policies.

Overall, the ARB health research program has components that explore the health effects of air pollution, environments with higher exposures, and mitigation opportunities.

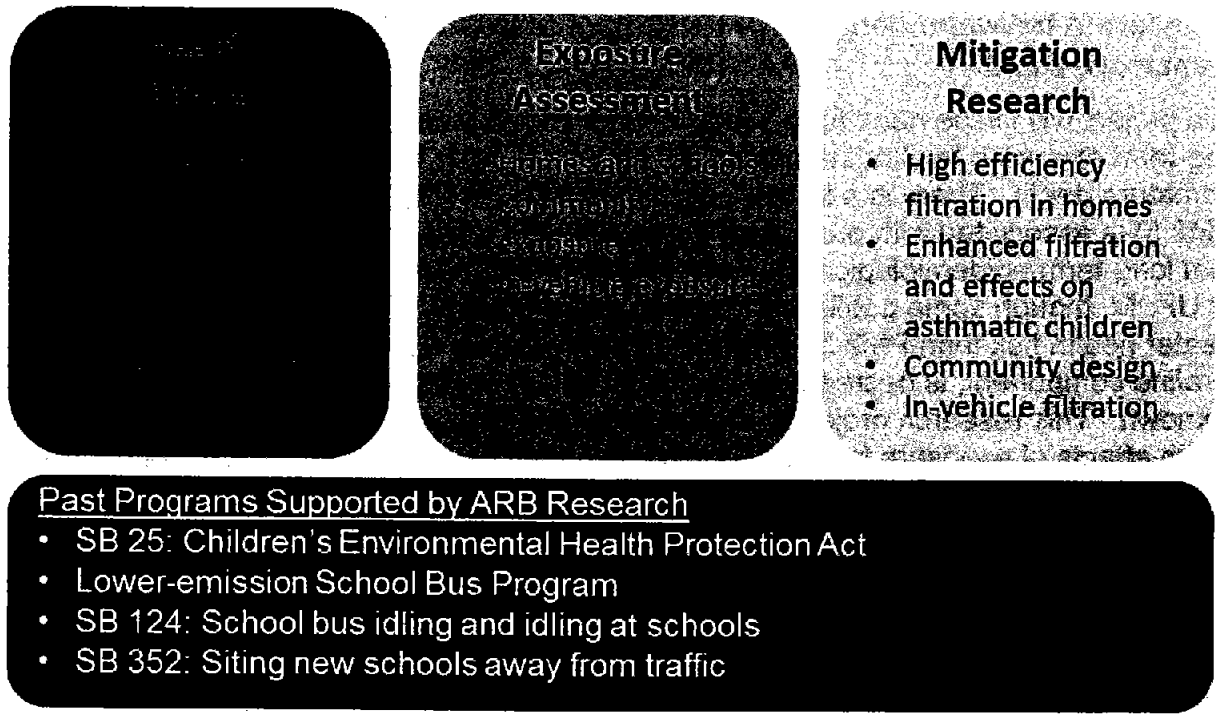


Figure 3. Selected components of ARB's health research program. ARB-funded research projects have added to the body of evidence on the health impacts of exposure to air pollutants, especially particulate matter and ozone. The highly cited Children's Health Study in the 1990s provided new information on how air pollution affects children's health and development, and set the stage for epidemiologic studies of other vulnerable populations, for toxicological studies, exposure studies, and for investigations on potential mitigation approaches.

FY 2014-15 Research Focus

The health research emphasis for FY 2014-15 is to better understand the health impacts of UFPM, specifically looking at premature death and neurodegenerative disease. Another project is to develop a standardized approach to toxicological screening assays used in assessing the potential toxicity of different fuels and engine technologies. The third project focuses on indoor air exposures by investigating the potential exposure and health risk from formaldehyde, a toxic air contaminant, from fiberglass particle filters used in home heating and cooling systems.

Proposed Projects

- Association between Long-Term Ultrafine Particulate Matter Exposure and Premature Death
- Exposure to Ultrafine Particulate Matter and Neurodegenerative Disease
- Protocol Development for Particulate Matter Sample Preparation for Toxicity Testing
- Reducing Formaldehyde Emissions from Home Central Heating and Air Conditioning Filters

Association between Long-Term Ultrafine Particulate Matter Exposure and Premature Death

This project will fill the need for a sound epidemiological study on the health effects of long-term exposure to ultrafine particulate matter (UFPM), focused on the risk of premature death. There is a large body of literature showing that fine particulate matter (PM2.5) is associated with premature death, with the most persuasive evidence coming from long-term epidemiological studies. No comprehensive epidemiological study exists for UFPM, though some published research suggests that UFPM may pose a relatively greater health risk than PM2.5. While PM2.5 pollution in California, which includes an ultrafine component, is decreasing, the health risk associated with UFPM exposure is unknown. This research project is expected to lead to a clearer understanding of the health effects of exposure to UFPM, including health risk at ambient air concentrations.

Background: ARB, U.S. EPA, and others have funded toxicological and animal studies on the health effects of UFPM exposure, which have shed light on the potential mechanisms and pathways by which these particles can affect human health. Significant findings in these studies include evidence of cardiovascular effects in animals and humans. Although some UFPM epidemiologic studies have been published, the results are inconsistent, and the studies lacked adequate exposure assessment at the regional level.

Methods: The ambient concentrations of UFPM in California show strong spatial gradients, which have not been adequately characterized by monitoring at the regional level. This research proposal addresses this challenge using a combination of modeling and air monitoring. This project will also pair the ambient concentrations of UFPM with an existing epidemiological cohort. The U.S. EPA funded a research grant to UC Davis to conduct UFPM modeling research which is close to completion. The UC Davis team modeled UFPM concentrations, but there was not time to adequately verify the results with monitoring data. This proposed project will build on these preliminary findings by verifying the modeling results with monitoring data, and modifying the model based on UFPM measurements. This proposal has four parts: 1) a model that will provide daily and annual average concentrations of UFPM at various representative sites Statewide; 2) full validation of the model through comparison of its output with historical data; 3) an assessment of the Statewide UFPM concentrations via monitoring; and 4) an epidemiological study with an existing cohort to calculate the relative risk of premature death and other health endpoints from long-term exposure to UFPM.

Budget: $800,000

Exposure to Ultrafine Particulate Matter and Pathogenesis of Neurodegenerative Disease

This project will determine whether long-term exposure to ultrafine particulate matter (UFPM) is associated with the development of neurodegenerative processes and related cognitive deficits. Emerging evidence suggests that environmental factors, including exposure to air pollutants such as UFPM, may play a role in neurodegenerative diseases (ND) such as Alzheimer's and Parkinson's disease. These conditions primarily affect the elderly. The cause of these disorders is not understood,

and genetic factors alone seem insufficient to explain their prevalence. UFPM is an important size fraction to examine because several reports in the literature have shown that these small particles are transported directly into the brain.

Long-term UFPM exposures will be conducted in a rodent model of neurodegenerative disease, and cognitive behavioral outcomes will be related to subjects' age and duration of exposure. Neurodegenerative diseases are characterized by the progressive decay of structure and function of nerve cells, and associated declines in cognitive performance. The first question to be addressed is whether UFPM exposure causes adverse changes in cognitive function that increase with subjects' age and duration of exposure. The second question is whether UFPM exposure activates the central nervous system's immune response which is believed to be an early stage in the neurodegenerative process.

Background: Very little is known about the mechanisms by which exposure to air pollutants leads to neurodegenerative outcomes. Findings from several epidemiologic and animal studies suggest associations between exposure to ambient air pollution (such as traffic pollutants or black carbon) and cognitive declines. Evidence of diffuse amyloid plaques has been found in children and young adults exposed to high levels of air pollution in Mexico City. This is a sign of neurodegeneration resembling early stages of development of Alzheimer's disease. Other studies have shown that inhaled UFPM can travel directly to the brain via the olfactory nerve and that UFPM exposure can lead to increased levels of pro-inflammatory markers in the brain. Chronic inflammation may lead to neuronal damage and nervous system dysfunction.

Numerous animal models of neurodegenerative disease have been developed to demonstrate various facets of the disease and associated cognitive deficits, such as declines in spatial learning and memory. A number of rodent studies have shown changes in learning, memory, and behavior in response to air pollutant exposures, with some showing symptoms parallel to those observed in human patients. Previous studies have not focused on combining animal neurodegenerative models with air pollution exposures.

Methods: The exposure study will use rodents since they have been successfully used in both PM2.5 and UFPM neurotoxicity studies. Researchers can choose from a number of animal models that have been used over the last decade in neurological studies, due to their ability to display plaques, tangles, synaptic loss, neuronal loss, or even cognitive deficits. Changes in cognition to be studied may include deficits in spatial learning and memory. To test for immune responses, the researchers will examine markers of chronic neuroinflammation. Other indicators of neurodegenerative disease, such as the deposition of β-amyloid, should be evaluated.

Budget: $500,000

Protocol Development for Vehicle Emission Toxicity Testing for Particulate Matter

This project will develop a recommended standard operating protocol (SOP) for fine particulate matter (PM2.5) toxicological assays used as a screening tool for assessing

relative health risk of engine technologies and fuels. Standard toxicological assays of PM emissions have been used as a screen by ARB as one method of ensuring that no unintended adverse health effects result as new engine technologies and fuels come into use. While these assays are based on established procedures in the literature, there is no SOP for sample preparation for these assays. The lack of an SOP has introduced uncertainty and sample variability even within the same study, and has limited staff's ability to compare results between past and current studies. This will continue to be an issue for future study evaluations unless methodologies are better aligned through use of an established SOP. To the extent possible, the research will compare the recommended protocol with previously used procedures to assist ARB in interpreting the toxicity results from past studies.

Background: ARB has evaluated the toxicity of PM2.5 in numerous studies including those involved with engine emissions testing, indoor air pollutants, and concentrated ambient air pollutant samples. Due to the lack of an SOP, individual researchers have used different methodologies for PM2.5 sample preparation which can affect the inherent toxicological properties of the sample. Toxicological variations arise from the different physical and chemical interactions that occur during processing which can preserve some critical PM2.5 components, eliminate others, and possibly introduce artifacts that could lead to false positive results. While possibly acceptable for comparison of samples for a particular assay, the different processes used for PM2.5 sample preparations have compromised the ability to directly compare the toxicity of samples from different researchers even for the same PM2.5 sample. For example, in a recent study, one researcher evaporated the sample extraction solvent before toxicological testing while another used the solvent extraction directly. It is not known if the evaporation removed critical PM2.5 components or if using the solvent extraction directly introduced toxicological artifacts making result comparisons difficult. Best practices for sample preparation are needed, and there has not been a comprehensive evaluation of the merits of the various procedures.

Methods: Researchers will evaluate commonly used procedures for PM2.5 sample preparation, assess the relative merits, and recommend a standard operating protocol for assays used for PM2.5 toxicity of vehicle emissions. In developing a recommended SOP, researchers will consult with agencies and academics with relevant experience. The evaluation should focus on which procedures are the best at protecting sample chemical integrity, retaining the most toxicologically relevant chemicals, and producing the fewest false positive toxicological artifacts.

Budget: $100,000

Reducing Formaldehyde Emissions from Home Central Heating and Air Conditioning Filters

This project will explore the benefits of use of formaldehyde-free particle filters in residential heating and cooling systems. The study will expand on preliminary data showing that fiberglass particle filters contribute substantially to indoor formaldehyde concentrations. The project will collect data on how much fiberglass particle filters contribute to indoor formaldehyde concentrations across a range of humidity levels and

other conditions typical of California homes. This data will help inform decision-makers about whether synthetic and other formaldehyde-free filters are a part of the solution to reduce indoor formaldehyde exposures. The results of this study are expected to provide information that can be used to support revisions to the California's building code specifications for central heating and air conditioning filters that would reduce indoor formaldehyde exposure. Formaldehyde is a toxic air contaminant which poses a risk of cancer and other adverse health impacts.

Background: Based on recent research by Lawrence Berkeley National Laboratory (LBNL), fiberglass particle filters in central heating and air conditioning systems may be the next largest source of indoor formaldehyde levels after composite wood products. In limited laboratory and field studies, fiberglass particle filters produced indoor concentrations that exceeded OEHHA's non-cancer 8-hour and Chronic Reference Exposure Levels (RELs) for formaldehyde (both set at 9 $\mu g/m^3$). However, these preliminary results were based on just a few measurements under limited conditions. Further study is needed to quantify the contribution of fiberglass filters to indoor concentrations of formaldehyde in California homes and evaluate the benefits of synthetic and other formaldehyde-free filters. LBNL found that emissions of formaldehyde increased with increasing relative humidity (RH). At 50% relative humidity the use of fiberglass filters increased room formaldehyde levels by 18-24%, adding an average 4 $\mu g/m^3$ to room concentrations. This is significant because 98% of the California population lives in areas where the annual average RH level is 50% or higher. At 80% RH, room concentrations increased an average of 6 $\mu g/m^3$. For comparison, outdoor formaldehyde concentrations in California average 3.2 $\mu g/m^3$.

There is limited recent data for older California homes, but the median formaldehyde level found in a 2009 study of new California homes was 36 $\mu g/m^3$. ARB's composite wood regulation is expected to reduce new home concentrations by up to 40%, for an estimated median formaldehyde level of about 22 $\mu g/m^3$ in future new homes. Aside from composite wood products there are many other indoor sources of formaldehyde, but none are suspected to individually contribute as much formaldehyde as the fiberglass filters. The LBNL study suggests that changing filter type could reduce indoor concentrations by about 4-5 $\mu g/m^3$ in future new homes, but further research is needed to confirm and quantify these results under a variety of conditions found in California homes.

Methods: The investigators will measure formaldehyde emissions from fiberglass filters, synthetic filters, and other formaldehyde-free filters in bench-scale laboratory tests. Experiments will be performed across a range of real world conditions observed in California homes, including different humidity levels, temperatures, and air exchange rates. The contributions of fiberglass filters and formaldehyde-free filters under similar conditions will be compared to quantify the exposure reduction that would likely be achieved by using synthetic filters and other formaldehyde-free filters.

Budget: $350,000

ATMOSPHERIC SCIENCE

Current Research

ARB research continues to improve the scientific foundation for California's efforts to meet air quality standards and reduce the health risk from air pollution. To support efforts to meet NAAQS, research has resulted in improvements to emissions inventories, chemical mechanisms in air quality models, and field studies to better understand the nature of the air pollution problems in the South Coast Air Basin and San Joaquin Valley.

CalNex 2010 was an important field study with two monitoring supersites, multiple aircraft, a research vessel, and participation by over a hundred scientists. One supersite was in Pasadena and the other was in Bakersfield. The study was designed by ARB and National Oceanic and Atmospheric Administration staff to answer 12 policy-relevant science questions on air quality, climate, and their nexus throughout California. ARB's contribution to this research effort was leveraged by major contributions from NOAA and dozens of independently funded academic research groups who joined the study. NOAA is completing a synthesis report of policy relevant findings from the CalNex 2010 Field Study which will be presented to the Board in the spring of 2014.

Much of ARB's current air quality science research and research collaborations build on previous work. In addition to CalNex 2010, the Carbonaceous Aerosol and Radiative Effects Study (CARES) study funded by the Department of Energy, focused on the formation of carbonaceous aerosols in the Sacramento/foothills transport corridor. ARB is supporting additional analysis of PM2.5 components from the CARES study. The San Joaquin Valley was one of the deployment locations for NASA's DISCOVER-AQ in January/February of 2013, and some of the proposed research will take advantage of that effort.

While ARB continues to support improvements to the SAPRC chemical mechanism for gases, another project is developing the Statistical Oxidation Model (SOM) to provide multiple tools for modelers to address the complex problem of modeling secondary organic aerosol (SOA) formation. The sources, impacts of existing controls, precursors, and processes which form SOA are the focus of several research projects. Organic aerosols comprise a significant fraction of PM2.5 in California. Improving the knowledge of the portion that is SOA, as well as the sources and mechanisms of SOA formation, will improve PM2.5 modeling used in State Implementation Plans (SIP). Last year, ARB funded projects to address questions concerning organic compounds used in consumer products. These projects will answer questions about the actual impact of these compounds on ozone and SOA formation and the environmental fate of exempt "low-vapor-pressure" (LVP) VOCs.

ARB also sponsors two major series of scientific conferences biennially at the University of California at Davis. The first, the International Conference on Atmospheric Chemical Mechanisms (ACM), mainly focuses on gas-phase chemistry that leads to ozone

formation. The fourth ACM conference was held in December 2012. The second, International Aerosol Modeling Algorithms (IAMA) conference, is focused on the particulate matter formation mechanisms. The fourth IAMA conference will be held in December 2013.

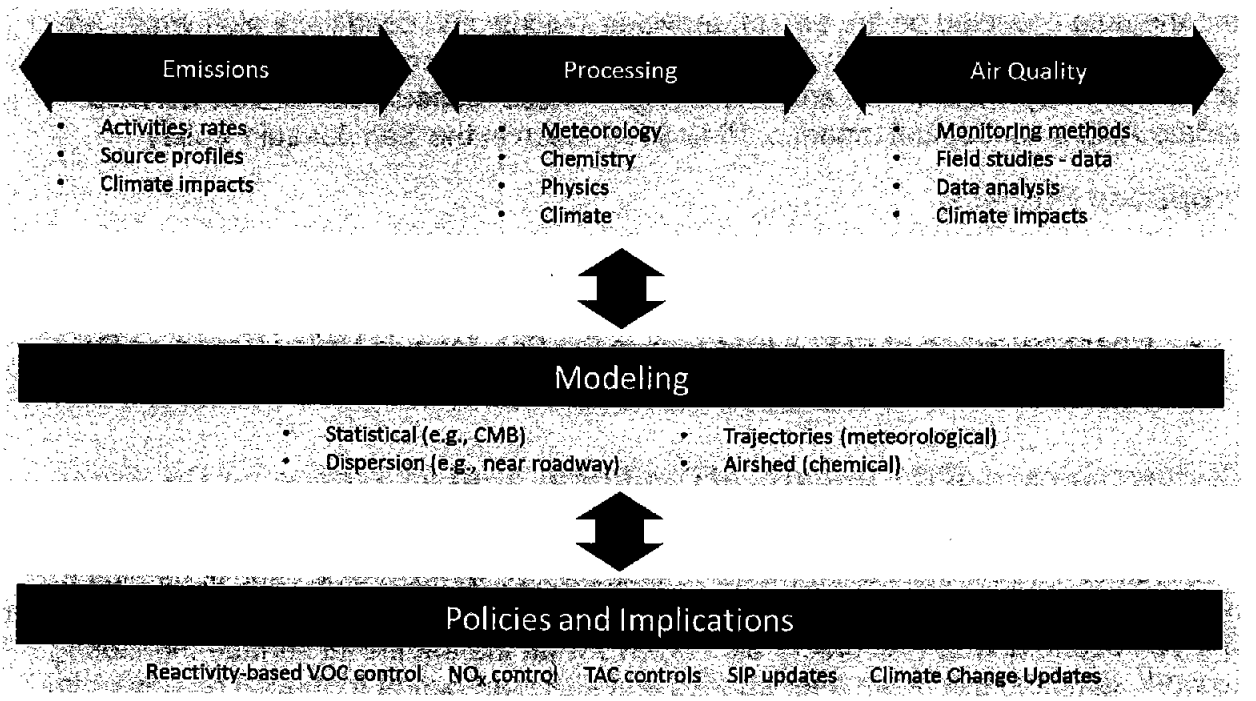


Figure 4. Air quality science research spans the collection and analysis of air quality data, understanding emissions sources, and air quality and meteorological modeling. This scientific foundation supports development of effective strategies to reduce emissions and meet Clean Air Act requirements for State Implementation Plans (SIPs).

FY 2014-15 Research Focus

Decision-makers rely on results from air quality models to provide predictions of future air pollution levels for use in developing required air quality plans and emission reduction strategies. Air quality models are also used to explore the relative effectiveness of reducing specific air pollutants, and their precursors, to meet air quality standards. Improvements to air quality modeling systems involve input data, modeling algorithms, and key components of the models such as chemical mechanisms.

There are two projects proposed to improve aspects of ozone and particulate matter modeling for the San Joaquin Valley. The first project will collect airborne air quality and meteorological measurements to help understand how ozone and its precursors found aloft may impact ground level ozone concentrations. The aloft measurements are designed to capture the impact of nighttime chemistry and meteorology on the next day's ozone levels. The carryover of ozone from one day to the next impacts surface ozone levels, and the frequent temperature inversions, which form in the San Joaquin Valley, provide a mechanism for sequestering ozone and precursors aloft overnight. A

better characterization of the vertical profiles of pollutants in the atmosphere will enable improvements to ozone SIP modeling. The second project will support updates to the particulate matter modeling for the San Joaquin Valley needed to address the more stringent annual PM2.5 standard adopted by the U.S. EPA in 2012. This project will provide analyses of data collected during the winter 2013 DISCOVER-AQ study by NASA. This study captured two multi-day PM2.5 episodes in the San Joaquin Valley, and the data collected on the aircraft provides insights into conditions aloft which are key to PM2.5 formation over a period of days. Elevated concentrations during the winter are a key driver of the annual average. These measurements aloft will help update ARB's conceptual model of PM2.5 formation in the San Joaquin Valley.

Proposed Projects

- Characterization of the Impacts of Conditions Aloft on Surface Air Quality to Improve SIP Modeling
- Characterization of PM2.5 Episodes in the San Joaquin Valley Based on Data Collected During the NASA DISCOVER-AQ Study in the Winter of 2013

Characterization of the Impacts of Conditions Aloft on Surface Air Quality to Improve SIP Modeling

This project will collect measurements to characterize atmospheric conditions aloft to improve ARB's modeling of ozone concentrations in the San Joaquin Valley. The extent to which ozone and its precursors aloft (above what the traditional surface monitoring network samples) mix down after sunrise and kick-start ozone formation on days with high concentrations is currently unclear. This research project is designed to improve the accuracy of the modeled structure, mixing, and composition of the atmosphere by making air quality and meteorological measurements aloft on days anticipated to have high ozone concentrations at ground-level sites in the San Joaquin Valley. These measurements of conditions aloft will help improve the ozone modeling for the SIP.

Background: The San Joaquin Valley is classified as an extreme ozone nonattainment area for the 8-hour ozone NAAQS. All sources of ozone contributing to high ground level ozone concentrations must be reflected in air quality models in order to characterize atmospheric processes appropriately. Several of these contributing sources are associated with conditions in the atmosphere occurring above the area characterized by the routine ground level monitoring network. While past field studies have included some measurements of conditions aloft in the San Joaquin Valley, most of these older measurements no longer represent current conditions, or were not made when ozone concentrations were representative of ozone values which need to be used in developing SIPs. Additional research is needed to better characterize the role that ozone aloft plays in causing exceedances of the NAAQS. Because ozone aloft can persist many days with minimal titration or deposition, a reservoir of pollutants aloft can mix down in the morning and kick-start the generation of high ozone concentrations at ground-level. Knowledge of the vertical structure, mixing, and composition of the atmosphere is important for understanding and accurately modeling the causes of high concentrations of ozone in the San Joaquin Valley.

Methods: Detailed air quality and meteorological measurements will be made in the southern San Joaquin Valley during the development of at least two episodes with high ozone concentrations. This project would collect ozone and meteorological data aloft on a number of summer days forecast to exceed the ozone standard. The measurements will be used to improve the chemistry and advection/diffusion modules in air quality models that represent the atmospheric processes occurring above where the routine monitoring network can sample. These results will be used to improve ARB's ozone SIP modeling.

Budget: $300,000

Characterization of PM2.5 Episodes in the San Joaquin Valley Based on Data Collected During the NASA DISCOVER-AQ Study in the Winter of 2013

This project will further understanding of the formation processes, sources, and composition of PM2.5 in the San Joaquin Valley (SJV), and be used to update ARB's modeling of PM2.5 in the region. This project will investigate the physical and chemical processes that led to high PM2.5 concentrations in the Fresno area during the DISCOVER-AQ field study in the winter of 2013. The DISCOVER-AQ study collected data from multiple flights during two PM2.5 episodes. Analysis of this data will enhance understanding of PM2.5 formation in the SJV, and will provide updated information for use in SIP modeling for the revised annual PM2.5 standard adopted by U.S EPA in 2012.

Background: PM2.5 particles are both emitted and formed through atmospheric reactions of precursor pollutants. Concentrations are highest in the SJV during the winter, when cool stable conditions and low wind speeds coupled with the Valley's topography limit dispersion of emissions and allow multi-day buildups of PM2.5 concentrations to occur. The NASA 2013 DISCOVERY-AQ study was designed to explore the ability of satellites to diagnose surface air quality by characterizing high PM2.5 concentrations and relating them to satellite observations. The measurement program for this study occurred in January/February 2013 and created an extensive set of surface and aloft (aircraft) ambient data that further enhance the utility of the satellite data. This research project will perform advanced analysis on the San Joaquin Valley DISCOVER-AQ data set (aircraft and ground-based measurements), investigating the spatial and temporal distributions of the PM2.5 and its precursors, and their evolution during at least two extended episodes with high PM2.5 concentrations.

Methods: The project will analyze and model two basic sets of data: 1) surface data collected at a site in Fresno, featuring highly time-resolved data from several state-of-the-science real-time instruments (including a high-resolution mass spectrometer (HR-AMS), a PILS-IC, two SMPSs, a cavity ring down spectrometer, and a single particle soot photometer) and 2) multiple data sets collected by NASA's two aircraft, which include multiple spirals over surface monitors. The data will be analyzed to better understand the factors creating the 3-D structure and spatial variability of high PM2.5 concentrations.

Budget: $200,000

MOBILE SOURCE EMISSIONS

Current Research

ARB's mobile source emissions research program supports California's effort to meet NAAQS, reduce health risk from toxic air contaminants, and meet greenhouse gas (GHG) reduction goals. Research on vehicles and fuels supports the development and implementation of regulations and incentive programs that reduce transportation related emissions. Off-road mobile engines are also a high priority. ARB research monitors the effectiveness of emission reduction strategies to ensure that the expected air quality and public health benefits are achieved.

ARB research currently underway focuses on understanding the trends in the on-road emissions from light-duty vehicles, and tracking the results of regulations and programs to reduce diesel particulate matter (DPM) emissions by 85% by 2020. Research on diesel emissions is multipronged, and includes research on the effect of in-use rules for heavy-duty (HD) diesel vehicles (i.e. Drayage and Truck and Bus Rules), the durability, degradation, and failure rates of aftertreatment that reduces NO_x and DPM, and the real-world efficacy of NO_x controls. Research is also underway to explore the ability of current diesel control technology to achieve NO_x reductions beyond the current emission standards, which will be needed to meet increasingly stringent NAAQS over the next decade.

ARB's Truck and Bus Rule requires nearly all HD diesel vehicles operating in California to be equipped with diesel particulate filters by 2014, and the 2010 heavy-duty engine emissions standard for NO_x will result in the use of selective catalytic reduction (SCR) in most late model HD diesel vehicles. ARB has research projects in place to evaluate how well these aftertreatment controls perform in the real world over time. This research will also address the issue of cold starts and low-load operation in the HD diesel fleet since SCRs requires minimum temperatures of almost 200 degrees Celsius before any NO_x can be reduced. Results from this work will determine the overall effectiveness to selective catalytic reduction (SCR) in reducing NO_x from heavy-duty diesel vehicles.

Current research also includes the investigation of the long-term durability and degradation rates of HD diesel aftertreatment, specifically diesel particle filters and selective catalytic reduction (SCR). This will be accomplished using measurements of emissions from the in-use fleet in tunnels and at weigh-in-motion stations in California. Additional research is investigating the long-term trend in measurements of emissions using remote sensing from light duty vehicles in Los Angeles, which will provide an understanding of how well the emission controls continue to perform in vehicles subject to LEV I and LEV II.

In-house research also includes the deployment of a mobile measurement platform in collaboration with UCLA. The mobile monitoring platform measures key gaseous and particle species, including PM2.5, black carbon, carbon dioxide and NO_x, with high spatial and temporal resolution. This effort has shown that emissions of black carbon and NO_x from heavy-duty diesel trucks on a port truck dominated freeway were reduced by 50 percent or more from 2009 to 2011, with preliminary results suggesting decreases in pollution in nearby neighborhoods as well. In the coming years, this research tool will

be used to help evaluate the ability of soundwalls to reduce the impact of traffic emissions on nearby neighborhoods, and the effect of the built environment on air pollution exposures.

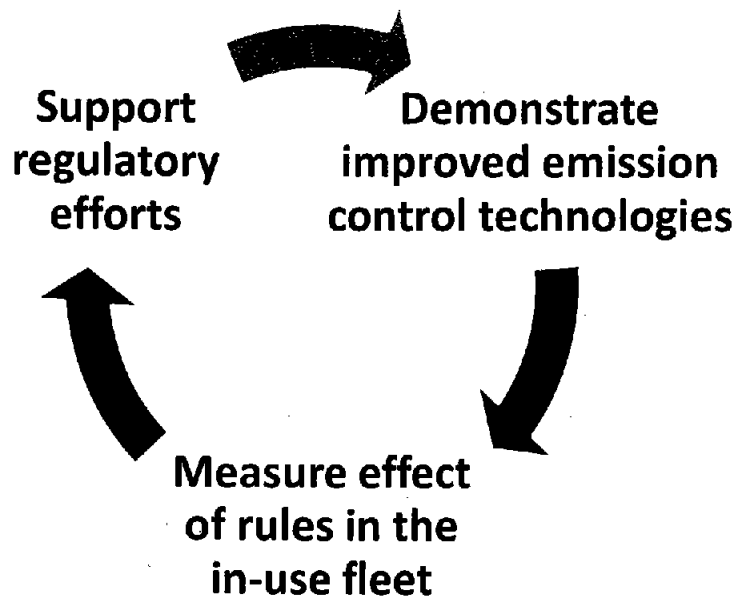


Figure 5. The vehicle emissions research process.

FY 2014-15 Focus

ARB's mobile source emissions research goals over the next 5 to 10 years reflect the need to continue to reduce emissions contributing to violations of NAAQS, to reduce health risk from toxic air contaminants, and to reduce greenhouse gases. For FY 2014-15, two projects are proposed to evaluate the adequacy of existing emission standards for NO_x and PM. Additional projects focused GHG reductions are discussed in the Climate Change section of this annual plan.

In the off-road sector, emissions standards have allowed smaller engines to be made and sold without the best available control technologies. The assumption has been that advanced aftertreatment would severely impact the cost of these smaller engines. This is especially relevant on a cost percentage basis as the technological cost component is a greater proportion of the total product cost for lower-power engines in comparison to average and higher power engines in the category. However, given the need for further emission reductions it is necessary to take another look at these engines to determine whether if aftertreatment is feasible and cost-effective. Another issue in the off-road sector is that engine manufacturers subject to most stringent new emissions standards, have been allowed to use emissions 'averaging' in demonstrating compliance. This regulatory flexibility results in fewer engines with the best available control, and may create certain vocations or geographical locations where engines emitting above standards are concentrated. There is a need to better understand the distribution of these engines in California, and the potential emission impacts on various locations Statewide.

Proposed Projects

- Evaluation of the Feasibility, Cost-effectiveness, and Necessity of Equipping Small Off Road Diesel Engines with Advanced PM and/or NO_x Aftertreatment
- Evaluation of The Impacts of Emissions Averaging and Flexibility Programs for All Tier 4 Final Off-Road Diesel Engines

Evaluation of the Feasibility, Cost-effectiveness, and Necessity of Equipping Small Off Road Diesel Engines with Advanced Diesel PM and/or NO_x Aftertreatment

This project will quantify the costs and performance of various emission control technologies, such as diesel particulate filters (DPF), selective catalyst reduction (SCR), and electronic fuel injection (EFI) for mobile off-road diesel engines with rated power less than 37 kilowatts (kW). These small (<37 kW) off-road diesel engines currently have less stringent standards than larger off-road engines. The project will also evaluate whether future regulatory measures to reduce emissions from this sector of the off-road industry are feasible and cost-effective. The results of this study will be used to determine whether or not small off-road engines should be subject to more stringent exhaust standards, identify reasonable levels of exhaust control based on costs, and support possible future amendments to the off-road diesel engine regulations in the 2016 timeframe.

Background: The majority of mobile diesel off road engines sold as new since 2011 are subject to regulations that require compliance with stringent diesel particulate matter (DPM) and NO_x exhaust standards based on the use of advanced aftertreatment technologies, such as DPF and SCR. However, off-road diesel engines less than 37 kW, such as loaders, tractors, pumps, compressors, generators, and refrigeration units produced by some manufacturers, are allowed to certify to less stringent emission standards. The reason for less stringent emission standards for small off-road equipment has been that advanced aftertreatment would severely impact the cost of these smaller engines. This is especially relevant on a cost percentage basis as the technological cost component is a greater proportion of the total product cost for lower-power engines in comparison to average and higher power engines in the category. Such findings were included in the U.S. EPA's Regulatory Impact Analysis (RIA) that was conducted in support of the 2004 federal rulemaking for adopting advanced aftertreatment standards (i.e., the current Tier 4 standards) for new off-road engines. At the time, anticipated emission control technologies were not in wide production so the RIA estimated the expected costs. However, some of the technologies anticipated in the RIA are now common today in both the off-road and on road diesel sectors. The "economies of scale" of today's market, as well as the availability of additional exhaust control strategies and techniques not evaluated originally in the RIA, warrants renewed consideration. Emission control technologies for small off-road equipment could assist in the reduction of statewide NO_x and DPM needed for California to attain its air quality goals. Small off-road equipment is estimated to contribute 27.6 tons of NO_x and 1.1 tons of DPM per day in 2020. These numbers represent 22 percent of the total off-road equipment NO_x emissions and 12 percent of total off-road equipment DPM emissions.

Methods: The proposed study will involve the emissions testing of several small off-road diesel engines representing a cross section of applications in the under-37 kW off-road diesel power category, including at least one engine commonly used in transport refrigeration unit applications. These engines will be modified to include various combinations of exhaust control technologies such as DPFs, SCR, EGR, EFI, and some will be modified to accommodate operation on alternate fuels, such as natural gas. Ideally, a complement of control engines will be evaluated concurrently with the modified engines. The investigation will also evaluate the overall emissions impact of this segment of the industry in order to assess the benefits of more stringent standards, and will seek to determine the representativeness of the existing test cycles for these smaller engines (e.g., discrete mode vs. ramped modal). Finally, the study will look at how increasing the cost of control might affect small diesel engine manufacturers, including potential market shifts toward gasoline-fueled engines if the relative cost of diesel-fueled engines increases.

Budget: $800,000

Evaluation of the Impacts of Emissions Averaging and Flexibility Programs for All Tier 4 Final Off-Road Diesel Engines

This study will examine the impact of the emissions averaging and flexibility provisions for compliance with Tier 4 final off-road emissions standards. The emissions impact of federal Averaging Banking, and Trading (ABT) program and the federal Transition Program for Equipment Manufacturers (TPEM) on the criteria pollutant emissions will be assessed for 2011 and later model year off-road diesel engines in California. The study will also identify possible options for ensuring that California does not receive more than its proportionate share of higher-emitting diesel engines under these programs, including federal action or ARB regulation.

Background: California is a participant in both the federally administered ABT and TPEM programs. These programs allow manufacturers to certify some engine families to previous less-stringent standards, as long as the manufacturer certifies enough engines below the more-stringent current standard to ensure its entire fleet average is at or below Tier 4 levels. However, because these programs are administered on a national level, it is likely that some states, or some regions within a state, may receive a disproportionate share of higher emitting engines. California's extreme ozone nonattainment areas need the full benefit of Tier 4 engines, making it important to understand the impact of the federal averaging and flexibility provisions.

Currently, there are no data to evaluate the distribution of ABT and TPEM higher emitting engines within California. Manufacturers are only required to report federal sales for engines certified under these programs. California-specific sales figures are needed. The Diesel Off-Road Online Reporting System (DOORS) includes Statewide engine totals for certain classes of off-road fleets and vehicles, and could be used to partially address program objectives at the Statewide level, but location specific use figures are needed.

Methods: The investigators will identify regions in California where the higher-emitting ABT and/or TPEM engines have been located, and determine whether California has

received more than a proportionate share of such engines. Additionally, the study will identify and quantify the number of sites with confined borders, such as landfills, construction sites, mining operations, etc., where higher emitting engines are prevalent, or at least make up a significant portion of the equipment fleet at the sites.

Budget: $300,000

TRANSPORTATION AND SUSTAINABLE COMMUNITIES

Current Research

ARB has several research projects underway to support California's efforts to reduce greenhouse gas emissions from the transportation system. ARB has initiated research that will quantify the electricity powered miles driven by advanced technology vehicles, analyze the charging behavior of electric vehicle drivers, explore how new car buyers' perceptions of zero-emission vehicles (ZEVs) influence their vehicle purchase decisions, develop methods for measurement of low levels of particulate matter emissions so that compliance can be reliably determined, and quantify the potential emission benefits of vehicle load reduction. Research in these areas will be coordinated with U.S. EPA and National Highway Traffic Safety Administration, and support the midterm review for the Advanced Clean Cars program.

Current research is also supporting the implementation of ARB's Low Carbon Fuel Standard (LCFS), which calls for a reduction of at least 10 percent in the carbon intensity of California's transportation fuels by 2020. The LCFS incentivizes the production and sale of low carbon-intensity transportation fuels by establishing a set of performance standards in the form of declining carbon-intensity levels that fuel producers and importers must meet each year for their fuel pools beginning in 2011. Two projects from last year's Research Plan are examining the potential to produce renewable natural gas and drop-in fuels at the commercial scale in California. Results from this research will maximize the market penetration of these alternative fuels and identify the technical, commercial, financial, marketplace, and regulatory barriers that need to be addressed. ARB also has a research project underway to model the air quality impacts of projected biomass and biogas utilization in the San Joaquin Valley and South Coast Air Basins.

Current sustainable communities research is aimed at supporting implementation of SB 375 as well as helping to pave the way to the 2050 climate goal. ARB research underway in this area covers a wide range of activities. Over the last few years, the Board has sponsored projects that address buildings energy use, consumer behavior, and reducing vehicle miles travelled and energy use in land use planning. Results from these projects will be translated into products that will assist local governments, planners, and other practioners to further reduce GHG emissions from the built environment.

As California cities build more compact, transit-oriented development, it is important to understand the health co-benefits of this type of development and to identify solution for any potential unintended consequences. While the health research program focuses on strategies, such as high efficiency filtration in homes and vehicles, the sustainable community research is examining additional means to further reduce exposure to traffic pollution, particularly for communities already located near major roadways. Sound walls in combination with vegetation may offer potential for substantially reducing exposures of those living near busy freeways. However, research is needed to

establish the air pollution reduction effectiveness of adding different types of vegetation to sound walls in California. Information about the effectiveness and cost of a host of strategies can help guide State and local agencies seeking air pollution mitigation options to protect communities already living near freeways.

Additionally, a recently launched project will assess how more compact development may alter air pollution exposure of pedestrians and transit users near traffic-related pollution sources, and examine how urban designs and traffic management might mitigate such exposures. Community design features, including cool pavements, offer extensive climate and health benefits. However, information on their performance and impacts, as well as guidance and tools to aid decision makers in adopting these strategies are needed. To advance this, ARB funded the first cool pavement demonstration project in the State. In addition, ARB is proposing to evaluate the life-cycle impacts of conventional and cool California pavements and to create a decision support tool to help local and regional decision makers identify strategies to reduce the greenhouse gas, air quality, and heat island impacts of their pavement systems.

Several research projects are underway to support updates to the building standards and better quantify greenhouse gas reductions of green buildings. Current research is also looking to reduce GHGs from the building sector by investigating how Californians interact with building technology in the residential and commercial sector. Research topics include identifying the factors that play into energy consumption in residential and commercial buildings and how residential consumers respond to information about electricity consumption. Additional research is exploring how commercial building operators, managers, and occupants respond to advanced visualization of building energy use and how people respond to social incentives regarding electricity consumption.

In Figure 6 below, elements of ARB' research on short-lived greenhouse gases are illustrated, including research projects and in-house efforts.

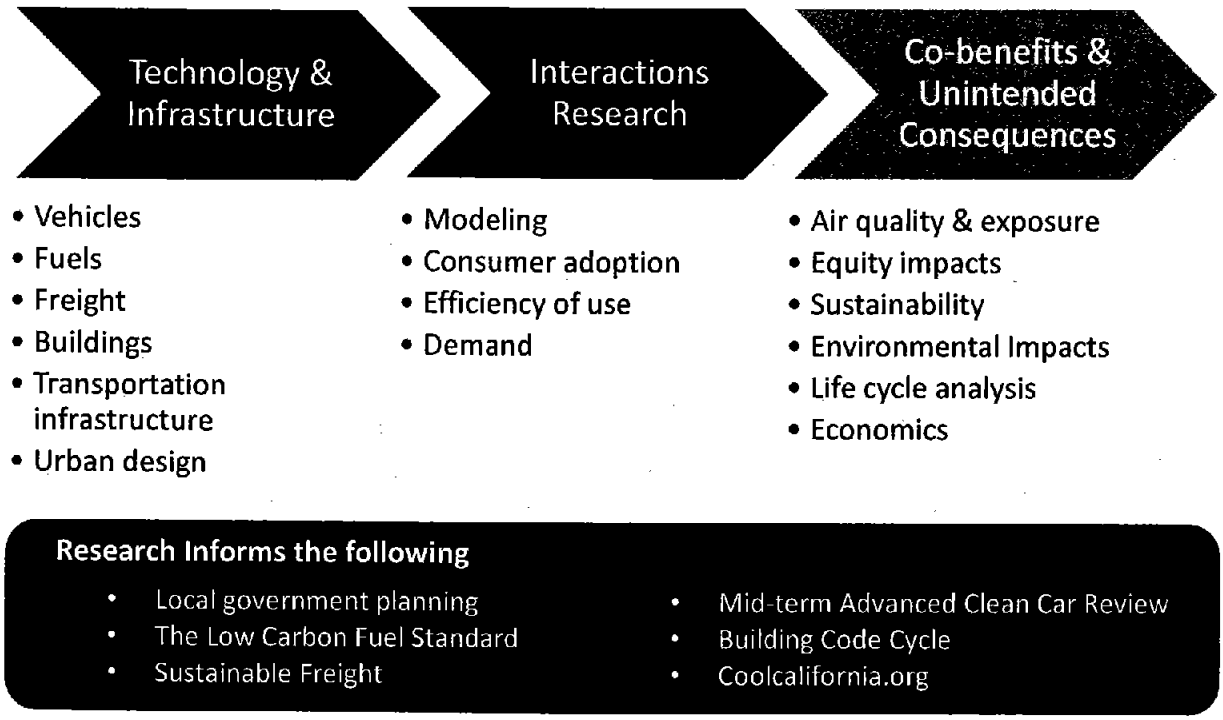


Figure 6. Sustainable communities and transportation research program overview.

FY 2014-15 Focus

This year's focus is on addressing how to move people and goods more efficiently and with zero or near-zero emissions. Projects are proposed to support implementation of ARB's Advanced Clean Car Program, to evaluate potential strategies to further reduce greenhouse gas emissions from heavy duty trucks, and to support implementation of ARB's low carbon fuel standard.

Proposed Projects

- Emission Reduction Assessment of Trailers (Not Including 53-Foot or Longer Box-Type Trailers) Pulled by Heavy-Duty Tractors
- The Dynamics of Plug-in Electric Vehicles in the Secondary Market and their Implications for Vehicle Demand, Durability, and Emissions
- Potential to Build Current Natural Gas Infrastructure to Accommodate the Future Conversion to Near-Zero Technology
- "Well to Wheel" Pathways for Zero and Near Zero Technology in California's Heavy Duty Sector

Emission Reduction Assessment of Trailers (Not Including 53-Foot or Longer Box-Type Trailers) Pulled by Heavy-Duty Tractors

This project will provide information that would be used by ARB staff to assess the potential GHG emission benefits from improved trailer aerodynamics and reduced trailer

tire rolling resistance on heavy-duty tractors pulling trailers that are exempted from the Tractor-Trailer GHG regulation.

Background: ARB's Tractor-Trailer GHG regulation requires 53-foot and longer box-type trailers traveling in California to be equipped with aerodynamic technologies (e.g., side-skirts, rear trailer fairings, and undertray devices) and low-rolling resistance tires, resulting in improved fuel economy and reduced GHG emissions from the heavy-duty tractors that pull them. Additional work is needed to see if the aerodynamics of exempted trailers (e.g., 48-foot box-type trailers, "pup" trailers, flat beds, curtain sides, and tankers) that spend less time on the highways can be improved as well, and if those improvements would lead to significant GHG emission reductions. Freight Wing, Inc., a company recently acquired by Ridge Corporation, is a manufacturer of side skirt technologies. Freight Wing conducted wind tunnel testing on "pup" trailers at the Automotive Research Center and has published the test results showing a 5 to 10 percent GHG emission reduction in a November 11, 2012 report. Freight Wing has also conducted wind tunnel testing on flatbed trailers equipped with skirts, but the results have not yet been published.

Methods: The investigators will identify the exempted trailer-types to be studied and conduct wind tunnel testing of each trailer type to evaluate the impact on tractor fuel consumption due to the installation of trailer aerodynamic technologies. The testing would be done in accordance with SAE J1252. The investigators will also work with trailer fleet owners and data log the activity of a representative number of each trailer type.

Budget: $500,000

The Dynamics of Plug-in Electric Vehicles in the Secondary Market and their Implications for Vehicle Demand, Durability, and Emissions

This project will determine the longer term emissions benefits of plug-in electric vehicles (PEVs) based on the dynamics of these vehicles in the secondary market. While manufacturer compliance with the Zero Emission Vehicle (ZEV) program is based on new vehicles sales, the expected emissions benefits will require that these vehicles, including PEVs, remain in the fleet past the first owner. The results of this study will be useful to refine long term projections of emissions benefits from PEVs, and to inform future policy decisions, beginning in 2016, on the treatment of these vehicles by various ARB programs, such as incentives, durability requirements, or vehicle crediting.

Background: PEV sales over the past three years are approaching a total of 50,000 and many early consumers have been opting to lease rather than purchase these vehicles – either in response to competitive lease offers, uncertainty about current technology, and/or expectations for future developments – which will accelerate the development of a large secondary market of PEVs. This market will begin developing in late 2013, and initiating new research in these early stages will allow for comprehensive monitoring of its development process.

Methods: The investigators will examine vehicle and market data on PEVs procured through commercial sources and/or collected directly from consumers. The data may

be analyzed using statistics, econometrics, or other methods. The evaluation will look at contribution of factors such as battery life, energy prices, infrastructure availability, attributes and prices of new vehicle offerings, and economic conditions, on the demand and prices of used PEVs and on their usage. The analysis will also evaluate whether the secondary market is expanding access to advanced clean cars, such as PEVs, to a wider array of consumers. Additionally, the study will explore the variety of reasons that PEVs are entering the used market in order to gauge consumer acceptance of this class of technology.

Budget: $300,000

Potential to Build Current Natural Gas Infrastructure to Accommodate the Future Conversion to Near-Zero Transportation Technology

This project will investigate how the near-term development of natural gas infrastructure, in the heavy-duty transportation sector, can be implemented to include technology that can best facilitate the long-term conversion to near-zero technology. The United States is experiencing a period of plentiful supplies of domestic natural gas that is cheap, relative to diesel fuel. In response, several large medium and heavy-duty fleet operators have announced intentions to convert their freight vehicles to be powered by natural gas. This will result in significant investments in fueling infrastructure in the near term. The role of policies and/or incentives that encourage the use of infrastructure that can accommodate both natural gas and alternative fuels will be explored. This investigation will focus on infrastructure for medium and heavy-duty fleets with a scope that includes potential synergies with light duty infrastructure. ARB's 2011 LCFS Program Review Report indicates that a major barrier to expanded alternative fuel use includes the availability of appropriate fuel infrastructure. Results will provide strategies to maximize the current market penetration of fuel infrastructure that can accommodate alternative fuels in the long term, which will ease the transition to a zero or near-zero transportation sector in the future. If this research leads to the development of a seamless transition to low-carbon fuels, it will smooth implementation of the LCFS and benefit California consumers.

Background: The abundance of natural gas coupled with its low price and multiple applications across all sectors, means that it will continue to play an important role in the transportation and energy sectors in the near future. Natural gas is often touted as a 'bridge' to low carbon fuels in the heavy duty transportation sector, and the abundance of natural gas fueled medium and heavy-duty fleets are growing rapidly. Research is needed to determine what natural gas infrastructure would be economically and technologically ideal for both natural gas in the near-term, and alternative fuels in the long term. The original design of the LCFS provides time for the development of advanced, near-zero technologies. However, having infrastructure already in place to deliver alternative fuels to fleets, once more alternative fuels are already in place, will ease the future transition to zero or near-zero transportation technology. ARB's current research is addressing the development of the commercial-scale production of alternative fuels in California. This proposed project will complement ARB's on-going work by exploring optimum paths for developing infrastructure in the near-term that will accommodate these fuels once that are being produced at the commercial scale.

Methods: Alternative fuels that should be considered in this analysis include hydrogen, hythane, renewable diesel, renewable natural gas, dimethyl ether (DME) and any near-zero fuels that may be in demonstration phase. After a thorough literature review, researchers will compile costs and technological and environmental limitations for fuel infrastructure (pipelines, storage tanks, filling stations, delivery trucks, etc.) to accommodate both natural gas and alternative fuels, for all levels of medium and heavy-duty fleet operation (private small fleet operators to large commercial distribution). The researchers will then define the technological and/or economic barriers to the availability of multi-use infrastructure and develop potential strategies that could be implemented by State agencies to encourage the use of such infrastructure in the near-term.

Budget: $250,000

"Well to Wheel" Pathways for Zero and Near Zero Technology in California's Heavy Duty Sector

This project will analyze novel "well to wheel" pathways for the delivery of hydrogen and/or hythane fuel in the medium and heavy-duty sector and assess the criteria pollutant and greenhouse gas (GHG) emissions associated with each pathway. The project supports implementation of ARB's Low Carbon Fuel Standard (LCFS), which calls for a reduction of at least 10 percent in the carbon intensity of California's transportation fuels by 2020. This project should provide a better understanding of the scenarios to deliver hydrogen fuel to fleets in the medium and heavy-duty sector under different cost and technology constraints, as well as how that fits into the use of current natural gas transportation pathways. The project will also consider how these pathways could leverage the use of current light duty infrastructure and planned hydrogen infrastructure for light duty. Potential markets for hydrogen, outside of the vehicle-fuel sector, will also be identified to ensure a more rigorous and sustainable market.

Background: The LCFS includes the use of hydrogen fuel as a transportation fuel for both light-duty and heavy-duty vehicle applications. However, the GHG emissions for pathways that provide medium and heavy-duty trucks with fuel may vary significantly. For example, it is expected that the main source of hydrogen will come from the reformation of natural gas, the remainder from renewables, such as solar powered electrolysis, smart grid electrolysis, land fill gas reclamation, and other sources of renewable natural gas. The combination of delivery mechanisms will also impact emissions for a given pathway. A number of fuel pathways have already been evaluated and published by ARB staff on the LCFS website (http://www.arb.ca.gov/fuels/lcfs/lcfs.htm). However, there a number of methods to optimize the reduction of emissions from given pathways. For example, the placement of onsite and centralized hydrogen production facilities could be optimized to facilitate the use of hydrogen in medium and heavy-duty fuel-cell vehicles (FCV) and hybrid FCVs. These tradeoffs need to be qualified and evaluated for California's needs. This project will address which hydrogen fuel production and delivery pathways produce the least GHGs and criteria pollutants at the least cost.

Methods: In order to assess the most effective combinations of alternative fuels, fuel infrastructure, and vehicle powertrain technology to reduce GHG and criteria air

pollutant emissions, the researchers will begin by compiling information on the potential availability of hydrogen fuel in California and its potential to fuel short haul, regional and long haul medium and heavy-duty vehicles. The review must not duplicate analyses already conducted by ARB staff and posted on ARB's internet site. The review should also include a thorough search to identify potential hydrogen markets that can be served by hydrogen facilities concurrently and/or prior to the widespread introduction of hydrogen in the light and heavy duty sectors. Multiple pathways should be developed to address what medium and heavy-duty vehicle travel characteristics (e.g. short haul, regional, or long haul) are needed, as well as how these pathways fit into current natural gas transportation pathways and how they may need to be transformed. This integration with natural gas infrastructure could also allow for the assessment of pathways that produce hythane fuel. This task should include a geospatial analysis for the delivery pathways and an analysis of how these pathways could tie into the light duty sector hydrogen infrastructure planning. Emphasis should be placed on optimizing onsite and centralized hydrogen production facilities that cater to medium and heavy-duty vehicles and hybrid fuel-cell vehicles. The pathways will then be assessed for technological and economic feasibility, as well as criteria pollutant and GHG emissions.

Budget: $250,000

SHORT-LIVED CLIMATE POLLUTANTS AND NITROUS OXIDE

Current Research

Short-lived climate pollutants are climate forcing agents that have a relatively short lifetime in the atmosphere (days to a few decades). The short lived climate pollutants that ARB's research focuses on are black carbon (BC), methane (CH_4) and high global warming potential (HGWP) gases, such as hydrofluorocarbons (HFC). In contrast, nitrous oxide (N_2O) has an atmospheric lifetime of 120 years. However, all of these non-CO_2 climate pollutants have high global warming potentials. In an effort to attain California's climate change goals, ARB's research program has focused on emission measurements, inventory development, and the creation of control options for these climate pollutants.

Using California's existing GHG monitoring network, ARB is investigating the sources and trends of CH_4 emissions in Los Angeles by complementing a five-year GHG monitoring project funded by the National Institute of Standards and Technology. The initial analysis, utilizing the monitoring network data, suggests a potentially large underestimation of CH_4 and N_2O, but further work is necessary to confirm the results and then attempt to identify the source(s) of the poorly characterized emissions. ARB's mobile monitoring platform was successfully deployed at a landfill and a natural gas compression station, and further work is planned to use mobile GHG instruments to better characterize sources of CH_4 and N_2O and assess local impacts of implemented regulations. Some of the sources to be monitored may include oil and gas production sites, natural gas pipelines, wastewater treatment plants, landfills, and composting facilities.

ARB has focused its N_2O research program on nitrogen fertilizer use in California cropping systems, including developing mitigation strategies. ARB, the California Energy Commission, and the California Department of Food and Agriculture are currently conducting field experiments in a number of crop production systems, characterizing effects of different nitrogen management practices on N_2O emissions, especially those with mitigation potential. Efforts are also underway to develop and validate a geochemical model called DeNitrification-DeComposition (DNDC), which is widely used for simulating GHG emissions from agricultural ecosystems. The modeling project is expected to provide ARB with California-specific emission assessment tools that can be used to evaluate dynamics of spatial and temporal GHG emissions from California agricultural lands under various soil, weather, and crop management conditions.

Current research on HGWP gases is addressing emissions from landfilled insulating foam. Previous estimates have been theoretical and uncertain, as no studies have measured landfilled foam emissions in actual landfill settings. The results will be used to better quantify GHG emissions from the insulating foam sector, to better inform waste foam management policy, and to update landfilled foam emission factors used in the ozone depleting substances destruction offset protocol for more accurate estimates of potential offsets from waste foam destruction.

In Figure 7 below, elements of ARB' research on short-lived greenhouse gases are illustrated, including research projects and in-house efforts.

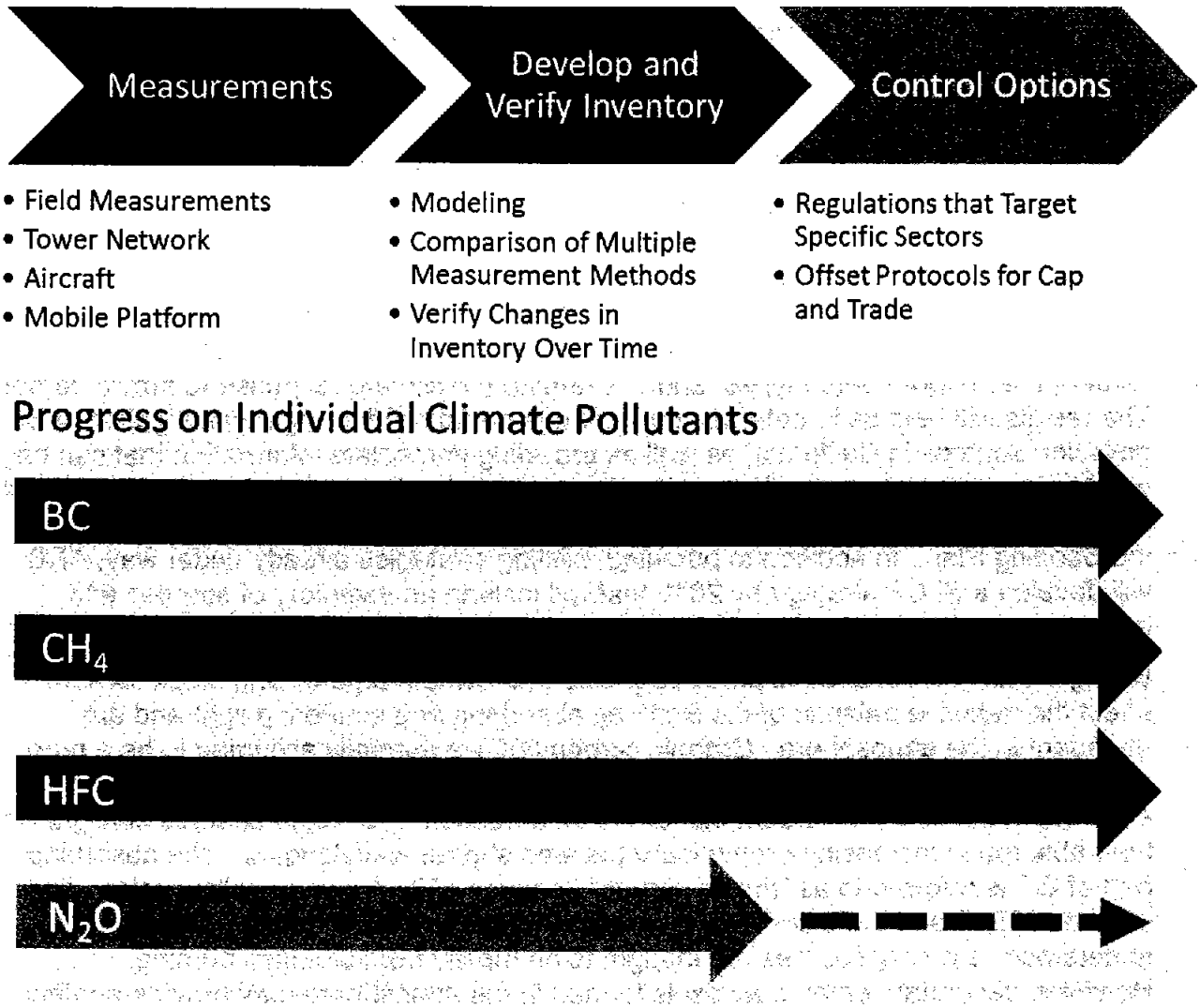


Figure 7. Research on short lived climate pollutants and N_2O. For specific gases, a solid arrow indicates a significant amount of research or the full implementation of some control options. However, there is ongoing research at all levels and for all gases. The dashed arrow for N_2O indicates that research on control measures has begun, but no offset protocols or regulations have been implemented.

FY 2014-15 Focus

Two research projects are proposed for short lived climate pollutants and N_2O. The first will characterize the contribution of brown carbon to climate forcing and air quality in California. The second project will develop a modeling tool to quantify the emission reduction potentials from various mitigation strategies that have been identified through previous ARB research.

Proposed Projects

- Characterizing the Air Quality and Climate Impacts of Brown Carbon
- Improving DNDC Modeling Capability to Quantify Mitigation Potential of Nitrous Oxide from California Agricultural Soils

Characterizing the Air Quality and Climate Impacts of Brown Carbon

This project will identify and characterize the contribution of brown carbon to air quality and climate forcing in California. Although brown carbon (BrC) is pervasive in the atmosphere, neither its sources nor the extent to which it contributes to direct aerosol climate forcing are well understood. State-of-the-art real-time measurement techniques will be deployed to determine the chemical composition and optical properties of brown carbon, their major source types, and to examine the climate response to brown carbon. The results will help us to determine the climate benefit of the ongoing mitigation of BrC emission sources in California, as well as providing immediate information that can be used to improve global climate models. Many short-lived climate pollutants (SLCP) are already regulated by ARB, either as part of the air quality and toxics program or under the Scoping Plan. In addition to pursuing existing strategies already under way, ARB will develop a SLCP strategy by 2016 that will include an inventory of sources and emissions, and a plan for developing necessary control measures.

Background: Carbonaceous particles (those that contain organic and black carbon) affect the radiative balance of the Earth by absorbing and scattering light and are abundant in the atmosphere. Organic carbon (OC) is normally assumed to be a pure scattering aerosol that leads to an overall cooling of the climate. However, recent experimental studies have demonstrated that a fraction of OC also absorbs sunlight with their absorption increasing dramatically towards shorter wavelengths. The absorbing part of OC is referred to as "brown carbon" because of its brown or yellow color. The sources of BrC and the extent to which it contributes to climate forcing are not well understood. Primary sources are thought to be mostly from biomass burning. However, secondary organic aerosols formed in the atmosphere may provide another source of brown carbon emissions. Furthermore, current climate models only treat brown carbon particles as a cooling agent. The BrC absorption could have a major impact on the direct climate forcing due to OC aerosols, just as the recent ARB project has shown for black carbon (BC) aerosols. The model results indicated that for the annual mean, the current top-of-atmosphere forcing of BC+OC varies from 0.2 Watts per square meter (W/m^2) over Northern California to as large as 1.9 W/m^2 over Southern California. Thus, models that neglect BrC severely overestimate the OC cooling effects.

A separation of the total aerosol absorption into different chemical species is essential, both for constraining the large uncertainties in current aerosol climate forcing estimates and for informing any emissions-based control policy. Direct aerosol climate forcing is understood now much better than 10 years ago. However, the tools to reduce uncertainties are still needed. Large uncertainties exist in current estimates of aerosol forcing because of incomplete knowledge concerning the distribution and the physical and chemical properties of aerosols as well as aerosol-cloud interactions. For example,

the aerosol indirect effect could vary by up to a factor of nine among climate models. Recent research activities are beginning to provide the needed inputs and constraints necessary to improve the accuracy of representation of aerosol effects in climate models. In addition they are allowing for a shift in estimates of aerosol radiative effect and climate forcing from largely model-based to an increasing level of measurement-model synthesis. Therefore, the light-adsorbing capacity of BrC should be incorporated into climate models so that its impact on net forcing can be assessed.

Methods: To characterize and differentiate sources of BrC from black carbon, advanced instrumentation will be deployed to collect chemical and optical properties of BrC sources and examine their contribution to OC in California. The instrumentation should include both high time resolution online non-filter-based instrumentation and detailed offline higher chemical resolution methods using appropriate low-artifact filters. Specifically, optical characterization should include both real-time measurements of suspended particles and additional filter measurements. Chemical characterization should include mass spectra of real-time submicron particles at high time resolution and offline measurements of functional group composition for both PM1 and PM2.5. Further, mass-based real-time measurements of BC at high time resolution should be included to characterize the non-OC absorption. Supporting measurements of size distributions should be included. This will include measurements at two sites in the San Joaquin Valley and South Coast Air Basins that investigate at least two types of BrC (e.g., residential burning versus urban secondary organic aerosols). The new observational capabilities together with dedicated aerosol modeling efforts will lead to a better understanding of the aerosol system, and to smaller uncertainties in estimates of BrC radiative effect and climate forcing.

Budget: $450,000

Improving DNDC Modeling Capability to Quantify Mitigation Potential of Nitrous Oxide from California Agricultural Soils

This project will develop and deliver a modeling tool that will allow for the quantification of the emission reduction potentials from various N_2O mitigation strategies that have been identified through previous ARB research. N_2O contributes about 15 million metric tonnes of CO_2 equivalents, or 3% of the California's GHG inventory. The majority of N_2O in California is produced by microbe-driven processes of nitrification and denitrification in the environment. Therefore, the surface fluxes of N_2O are highly variable, both spatially and temporally. Process-based models are useful in capturing this variability. The ability to quantify N_2O emissions under a variety of management practices will help identify effective mitigation measures to reduce emissions.

Background: Previous studies have delivered to ARB a validated California-specific modeling tool based on DeNitrification-DeComposition (DNDC), incorporating largely business as usual management practices for baseline emission assessment. However, the model needs further development to address changes in management designed for GHG mitigation purpose, and to scale up the limited field studies to estimate emission reduction potential from California agricultural soils Statewide.

Methods: The project will consist of the following tasks: 1) collect new field data from mitigation studies of N_2O emissions that have not been targeted before in previous DNDC validation (for example, the on-going UC Davis mitigation study by ARB and the paired studies by USDA assessing mitigation potential of selected mitigation options such as the use of nitrification inhibitors, dripping irrigations, specific nitrogen fertilizer types and different application methods, etc.); 2) improve the flexibility and robustness of the DNDC model in deriving N_2O estimates through additional DNDC model development, calibration, and validation for the selected mitigation scenarios and statistical analyses of DNDC model structural uncertainty to ensure model estimates are conservative; and 3) scale up the field studies to estimate mitigation potential of N_2O at the State level.

Budget: $200,000

NEXT STEPS

The 14 research projects proposed in this plan address key knowledge gaps and will strengthen the scientific foundation of health, air pollution and climate control programs, help develop future clean air regulations and programs, and measure the effectiveness of ARB's programs. Following Board action on the plan, staff will proceed to work with researchers to develop these research projects into complete proposals to be reviewed by ARB's Research Screening Committee and then brought to the Board for final funding approval. Results are anticipated in three to five years.