ENCLOSURE A

PROPOSED MODIFIED TEXT OF THE PROPOSED AMENDMENTS TO THE LEV III CRITERIA POLLUTANT REQUIREMENTS FOR LIGHT- AND MEDIUM-DUTY VEHICLES, THE HYBRID ELECTRIC VEHICLE TEST PROCEDURES, AND THE HEAVY-DUTY OTTO-CYCLE AND HEAVY-DUTY DIESEL TEST PROCEDURES

The following text contains staff's suggested modifications to the originally proposed regulatory language for sections 1961.2 and 1976, title 13 of the California Code of Regulations (CCR) and to 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;"
- "California Non-Methane Organic Gas Test Procedures;"
- "California Non-Methane Organic Gas Test Procedures for 2017 and Subsequent Model Year Vehicles;"
- "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles;"
- "California Refueling Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles;"
- "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle 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 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes."

Unless otherwise indicated below, the text of the originally proposed regulatory language is shown in <u>underline</u> to indicate additions and ~~strikeout~~ to indicate deletions. The suggested modifications to the proposed regulation are shown in <u><u>double underline</u></u> to indicate additions and ~~double strikeout~~ to indicate deletions. Staff is proposing modifications to limited portions of the original proposal; for some portions of the original proposal for which no modifications are proposed, the text has been omitted and the omission indicated by [No change] or "* * * *".

There are no additional suggested modifications to the originally proposed amendments to sections 1900, 1956.8, 1962.2, 1965, and 1978, title 13, CCR or to the incorporated test procedures.

Date of Release: December 23, 2014; Proposed 15-day Changes
Date of Hearing: October 23, 2014

SUGGESTED CHANGES TO PROPOSED REGULATION ORDER

1. Amend title 13, CCR, section 1961.2 to read as follows:

§ 1961.2. Exhaust Emission Standards and Test Procedures - 2015 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles.

* * * *

(a) *Exhaust Emission Standards.*

* * * *

(4) *50°F Exhaust Emission Standards.* All passenger cars, light-duty trucks, and medium-duty vehicles, other than natural gas and diesel-fueled vehicles, must demonstrate compliance with the following 4,000-mile exhaust emission standards for NMOG+NOx and formaldehyde (HCHO) measured on the FTP (40 CFR, Part 86, Subpart B) conducted at a nominal test temperature of 50°F, as modified by Part II, Section ~~C~~D 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." A manufacturer may demonstrate compliance with the NMOG+NOx and HCHO certification standards contained in this subparagraph by measuring NMHC exhaust emissions or issuing a statement of compliance for HCHO in accordance with Section D.10~~, subparagraph (p)~~ and Section G.3.1.2, respectively, 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." Emissions of CO measured at 50° F at 4,000 miles shall not exceed the standards set forth in subsection (a)(1) applicable to vehicles of the same emission category and vehicle type subject to a cold soak and emission test at 68° to 86° F.

* * * *

(6) *Highway NMOG + NOx Standard.* The maximum emissions of non-methane organic gas plus oxides of nitrogen measured on the federal Highway Fuel Economy Test (HWFET; 40 CFR Part 600 Subpart B or 40 CFR §1066.840 ~~600 Subpart B~~), as modified by 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," must not be greater than the

applicable LEV III NMOG+NOx standard set forth in subsection (a)(1). Both the sum of the NMOG+NOx emissions and the HWFET standard must be rounded in accordance with ASTM E29-67 to the nearest 0.001 g/mi before being compared.

* * * *

(8) *Interim In-Use Compliance Standards*.

* * * *

(C) SFTP *Interim In-Use Compliance Standards.*

* * * *

2. ~~Test groups certified prior to the 2021 model year will be allowed an in-use compliance standard for PM for the first five model years that they are certified to the SFTP PM standard. 2020~~2023 and prior model year light-duty and medium-duty passenger vehicle test groups that certify to a LEV III SFTP PM exhaust emission standard in subsection (a)(7)(B) may use an in-use compliance standard for SFTP PM regardless of the model year that the test groups first certified to the LEV III SFTP PM standard.~~and~~ 2022 and prior model year medium-duty vehicle test groups may use an in-use compliance standard for PM for the first two model years that they are certified to ~~the~~ a LEV III SFTP PM exhaust emission standard in subsection (a)(7)(D).

* * * *

(b) *Emission Standards Phase-In Requirements for Manufacturers.*

* * * *

(3) *LEV III Phase-In Requirements for Medium-Duty Vehicles, Other than Medium-Duty Passenger Vehicles*.

(A) *Requirement for Manufacturers Other than Small Volume Manufacturers*. A manufacturer of MDVs, other than a small volume manufacturer, shall certify its MDV fleet according to the following phase-in schedule:

Model Year	*Vehicles Certified to §1961.2(a)(1)[1] (%)*				*Vehicles Certified to §1956.8(c) or (h) (%)*
	LEV II LEV; LEV III LEV395 or LEV630	LEV II ULEV; LEV III ULEV340 or ULEV570	LEV III ULEV250 or ULEV400	LEV III SULEV170 or SULEV230	ULEV
2015	40	60	0	0	100
2016	20	60	20	0	100
2017	10	50	40	0	100
2018	0	40	50	10	100
2019	0	30	40	30	100
2020	0	20	30	50	100
2021	0	10	20	70	100
2022 +	0	0	10	90	100

[1] The LEV II LEV~~,~~ and LEV II ULEV~~,~~ emission categories are only applicable for the 2015 through 2019 model years. The LEV III LEV395, LEV630, ULEV340, and ULEV570 emission categories are only applicable for the 2015 through 2021 model years.

* * * *

(c) *Calculation of NMOG + NOx Credits/Debits*

* * * *

(2) *Calculation of NMOG+NOx Credits and Debits for Medium-Duty Vehicles Other than MDPVs.*

A manufacturer that elects to comply with the phase-in requirements for LEV III medium-duty vehicles other than MDPVs in subsection (b)(3)(A) or subsection (b)(3)(B) shall calculate vehicle-equivalent NMOG+NOx credits in accordance with subsection (c)(2)(A). A manufacturer that elects to comply with the alternative phase-in schedule for LEV III medium-duty vehicles other than MDPVs in subsection (b)(3)(C) shall calculate fleet average NMOG+NOx credits in accordance with subsection (c)(2)(B).

* * * *

(B) *Calculation of Fleet Average NMOG+NOx Credits and Debits for Medium-Duty Vehicles Other than MDPVs*.

* * * *

2. In 2016 and subsequent model years, a manufacturer that achieves fleet average NMOG+NOx values lower than the fleet average NMOG+NOx requirement for the corresponding model year shall receive credits in units of g/mi NMOG+NOx. A manufacturer with 2016 and subsequent model year fleet average NMOG+NOx values greater than the fleet average requirement for the corresponding model year shall receive debits in units of g/mi NMOG+NOx equal to the amount of negative credits determined by the aforementioned equation. The total g/mi NMOG+NOx credits or debits earned for MDVs 8,501-10,000 lbs. GVWR excluding MDPVs, and for MDVs 10,001-14,000 lbs. GVWR shall be summed together. The resulting amount shall constitute the g/mi NMOG+NOx credits or debits accrued by the manufacturer for the model year. Medium-duty fleet average credits and debits earned in accordance with subsection (c)(2)(B) may not be summed together with fleet average credits and debits earned for passenger cars, light-duty trucks, and medium-duty passenger vehicles in accordance with subsection (c)(1).

* * * *

2. Amend title 13, CCR, section 1976 to read as follows:

§ 1976. Standards and Test Procedures for Motor Vehicle Fuel Evaporative Emissions.

* * * *

(b)(1) Evaporative emissions for 1978 and subsequent model gasoline fueled, 1983 and subsequent model liquefied petroleum gas fueled, and 1993 and subsequent model alcohol fueled motor vehicles and hybrid electric vehicles subject to exhaust emission standards under this article, except petroleum fueled diesel vehicles, compressed natural gas fueled vehicles, hybrid electric vehicles that have sealed fuel systems which can be demonstrated to have no evaporative emissions, and motorcycles, shall not exceed the following standards:

* * * *

(G) For 2015 and subsequent model motor vehicles, the following evaporative emission requirements apply:

* * * *

2. *Phase-In Schedule*. For each model year, a manufacturer shall certify, at a minimum, the specified percentage of its vehicle fleet to the evaporative emission standards set forth in section 1976(b)(1)(G)1.a. or section 1976(b)(1)(G)1.b., according to the schedule set forth below. For the purpose of this section 1976(b)(1)(G)2., the manufacturer's vehicle fleet consists of the vehicles produced and delivered for sale by the manufacturer in California that are subject to the emission standards in section 1976(b)(1)(G)1. All 2015 through 2022 model motor vehicles that are not subject to these standards pursuant to the phase-in schedule shall comply with the requirements for 2004 through 2014 model motor vehicles, as described in section 1976(b)(1)(F), or the optional zero-fuel evaporative emission standards for 2001 through 2014 model motor vehicles, as described in section 1976(b)(1)(E).

Model Years	*Minimum Percentage of Vehicle Fleet* [(1)(2)]
2015, 2016, and 2017	Average of vehicles certified to section 1976(b)(1)(E) in model years 2012, 2013, and 2014[(3)(4)]
2018 and 2019	60
2020 and 2021	80
2022 and subsequent	100

* * * *

Date of Release: December 23, 2014; Proposed 15-day Changes
Date of Hearing: October 23, 2014

California Environmental Protection Agency
AIR RESOURCES BOARD

PROPOSED 15-DAY MODIFICATIONS

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

Adopted: March 22, 2012
Amended: December 6, 2012
Amended: [INSERT DATE OF AMENDMENT]

Note: The following text contains staff's suggested modifications to these test procedures as originally proposed September 2, 2014. Unless otherwise indicated below, the text of the originally proposed amendments to this document are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions compared to the test procedures as amended December 6, 2012. The modified language now proposed by staff is shown in double underline to indicate additions and ~~double strikeout~~ to indicate deletions. Staff is proposing modifications to limited portions of the original proposal; for some portions of the original proposal for which no modifications are proposed, the text has been omitted and the omission indicated by [No change] or "* * * *." [No change] - also 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: December 23, 2014; Proposed 15-day Changes
Date of Hearing: October 23, 2014

* * * *

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

* * * *

PART I: GENERAL PROVISIONS FOR CERTIFICATION AND IN-USE VERIFICATION OF EMISSIONS

* * * *

B. Definitions, Acronyms and Abbreviations

1. **§86.1803 Definitions.**

1.1 §86.1803-01. ~~October 15, 2012~~ ~~April 28, 2014~~ August 8, 2014. [No change, except as otherwise noted below.]

2. California Definitions.

*** * * ***

"**Highway Test Procedures**" means the Federal Test Procedure as set forth in 40 CFR Part 600 Subpart B~~,~~ or 40 CFR §1066.840 ~~Part 86~~, as modified in Part II of these test procedures with the migration provisions of §600.111-08 introduction, except that emissions shall be measured using the Highway Driving Schedule as set forth in Part II, Section F.

* * * *

D. §86.1810 General standards; increase in emissions; unsafe conditions; waivers

1. §86.1810-09. October 15, 2012. Amend §86.1810-09 as follows:

* * * *

1.10 Subparagraph (p) Amend as follows: For gasoline and diesel-fueled LEV II and LEV III vehicles, manufacturers may measure non-methane hydrocarbons (NMHC) in lieu of NMOG. The adjustment factors that must be applied to the measured NMHC emission levels before comparing them with the applicable standards are as follows:

1.10.1 *Compliance with the LEV II and LEV III exhaust standards in section E.1.1.1 and E.1.1.2, respectively.*

For LEV II vehicles that are certified using the California Gasoline Fuel Specifications set forth in Part II section 100.3.1.1 or using the federal *E0 certification gasoline in 40 CFR §86.113-04(a)(1)*, manufacturers must either (1) multiply NMHC measurements by an adjustment factor of 1.04 before comparing with the NMOG standard to determine compliance with the standard or (2) calculate the NMHC to NMOG adjustment factor in accordance with 40 CFR §1066.635, as modified by these test procedures, and multiply NMHC measurements by that calculated adjustment factor before comparing with the standard.

For LEV III vehicles and LEV II vehicles that are certified using the California Gasoline Fuel Specifications set forth in Part II, section 100.3.1.2 or using the federal *E10 certification gasoline in 40 CFR §*1065.710(b), manufacturers must either (1) multiply NMHC measurements by an adjustment factor of 1.10 before adding it to the measured NOx emissions and comparing with the NMOG+NOx standard in section E.1.1.2 or before comparing it to the NMOG standard in section E.1.1.1, as applicable, or (2) calculate the NMHC to NMOG adjustment factor in accordance with 40 CFR §1066.635, as modified by these test procedures, and multiply NMHC measurements by that calculated adjustment factor before comparing with the NMOG+NOx standard in section E.1.1.2 or before comparing it to the NMOG standard in section E.1.1.1, as applicable, to determine compliance with that standard.

For LEV III vehicles and LEV II vehicles that are certified using a gasoline fuel that contains an ethanol content greater than that allowed by the California Gasoline Fuel Specifications set forth in Part II, section 100.3.1.2 and less than or equal to 25 percent ethanol, the adjustment factor that must be used to demonstrate compliance with the NMOG+NOx standard in section E.1.1.2 or the NMOG standard in section E.1.1.1, as applicable, ~~this paragraph~~ is calculated using the following formula:

Adjustment factor = 1.0302 + 0.0071 x volume percent fuel ethanol

where the value for the “volume percent fuel ethanol” used in this formula is 15 if the gasoline contains 15 percent ethanol, the “volume percent fuel ethanol” used in this formula is 20 if the gasoline contains 20 percent ethanol, etc. Manufacturers must multiply NMHC measurements by this calculated adjustment factor before adding it to the measured NOx emissions and comparing with the NMOG+NOx standard in section E.1.1.2 or the NMOG standard in section E.1.1.1, as applicable, to determine compliance with that standard. Manufacturers may use other factors to adjust NMHC results to more properly represent NMOG results. Such factors must be

based upon comparative testing of NMOG and NMHC emissions and be approved in advance by the ~~Administrator~~Executive Officer.

1.10.2 *Compliance with the LEV II and LEV III SFTP standards in section E.1.2 and the Highway NMOG+NOx standard in section E.1.6.* For LEV III vehicles and LEV II vehicles that are certified to the SFTP Exhaust Emission Standards in section E.1.2 and/or the Highway NMOG+NOx Standard in section E.1.6 ~~, using the California Gasoline Fuel Specifications set forth in Part II, section 100.3.1.2,~~ manufacturers must multiply NMHC measurements by an adjustment factor of 1.03 before adding it to the measured NOx emissions and comparing with the NMOG+NOx standard to determine compliance with that standard. This adjustment factor is not dependent on the certification gasoline.

* * * *

2. §86.1810-17. April 28, 2014. Amend §86.1810-17 as follows:

* * * *

2.3 Subparagraph (f) Altitude Requirements. [No change, except that 50°F standards and SFTP standards shall only apply at low altitude conditions.]

* * * *

E. California Exhaust Emission Standards.

* * * *

1. Exhaust Emission Standards.

* * * *

1.4 50°F Exhaust Emission Standards.

1.4.1 Standards for Vehicles Certified to the LEV II Standards.

All passenger cars, light-duty trucks, and medium-duty vehicles certified to the LEV II exhaust emission standards set forth in subparagraph E.1.1.1 must demonstrate compliance with the following 4,000-mile exhaust emission standards for NMOG and formaldehyde measured on the FTP (40 CFR, Part 86, Subpart B) conducted at a nominal test temperature of 50°F, as modified by Part II, Section ~~C~~D of these test procedures. A manufacturer may demonstrate compliance with the NMOG and HCHO certification standards contained in this subparagraph 1.4.1 by measuring NMHC exhaust emissions in accordance with

section D.1.10~~, subparagraph (p)~~ and section G.3.1.2, respectively, of these test procedures. Emissions of CO and NOx measured at 50°F at 4,000 miles shall not exceed the standards set forth in section E.1.1.1 applicable to vehicles of the same emission category and vehicle type subject to a cold soak and emission test at 68° to 86°F. Natural gas and diesel-fueled vehicles are exempt from the 50°F test requirements.

* * * *

1.4.2 **Standards for Vehicles Certified to the LEV III Standards.**

All passenger cars, light-duty trucks, and medium-duty vehicles certified to the LEV III exhaust emission standards set forth in subparagraph E.1.1.2, other than natural gas and diesel fueled vehicles, must demonstrate compliance with the following 4,000-mile exhaust emission standards for NMOG+NOx and formaldehyde measured on the FTP (40 CFR, Part 86, Subpart B) conducted at a nominal test temperature of 50°F, as modified by Part II, Section ~~C~~D of these test procedures. A manufacturer may demonstrate compliance with the NMOG+NOx and HCHO certification standards contained in this subparagraph 1.4.2 by measuring NMHC exhaust emissions in accordance with section D.1.10~~, subparagraph (p)~~ and section G.3.1.2, respectively, of these test procedures. Emissions of CO measured at 50°F at 4,000 miles shall not exceed the standards set forth in section E.1.1.2 applicable to vehicles of the same emission category and vehicle type subject to a cold soak and emission test at 68° to 86°F.

* * * *

1.6 Highway NMOG + NOx Standard.

The maximum emissions of NMOG+NOx measured on the federal Highway Fuel Economy Test (HWFET; 40 CFR Part 600 Subpart B or 40 CFR §1066.840 ~~600 Subpart B~~, which ~~is~~ are incorporated herein by reference, as modified in Part II of these test procedures with the migration provisions of §600.111-08 introduction) must not be greater than the applicable LEV III NMOG+NOx standard set forth in section E.1.1.2. Both the sum of the NMOG+NOx emissions and the HWFET standard must be rounded in accordance with ASTM E29-67 to the nearest 0.001 g/mi before being compared.

* * * *

2. Emission Standards Phase-In Requirements for Manufacturers.

* * * *

2.3 LEV III Phase-In Requirements for Medium-Duty Vehicles Other than Medium-Duty Passenger Vehicles.

2.3.1 ~~(a)~~ **Requirements for Manufacturers Other Than Small Volume Manufacturers.** A manufacturer of MDVs, other than a small volume manufacturer, shall certify its MDV fleet according to the following phase-in schedule:

Model Year	Vehicles Certified to Section E.1.1[1] (%)				Vehicles Certified to title 13 CCR Section 1956.8(c) or (h) (%)
	LEV II LEV; LEV III LEV395 or LEV630	LEV II ULEV; LEV III ULEV340 or ULEV570	LEV III ULEV250 or ULEV400	LEV III SULEV170 or SULEV230	ULEV
2015	40	60	0	0	100
2016	20	60	20	0	100
2017	10	50	40	0	100
2018	0	40	50	10	100
2019	0	30	40	30	100
2020	0	20	30	50	100
2021	0	10	20	70	100
2022 +	0	0	10	90	100

[1] The LEV II LEV~~,~~ and LEV II ULEV, emission categories are only applicable for the 2015 through 2019 model years. The LEV III LEV395, LEV630, ULEV340, and ULEV570 emission categories are only applicable for the 2015 through 2021 model years.

* * * *

3. Calculation of Credits/Debits

3.1 Calcu*lation of NMOG+NOx Credits/Debits*

* * * *

3.1.2 **Calculation of NMOG+NOx Credits and Debits for Medium-Duty Vehicles Other than MDPVs.**

A manufacturer that elects to comply with the phase-in requirements for LEV III medium-duty vehicles other than MDPVs in section E.2.3.1 or section E.2.3.2 shall calculate vehicle-equivalent NMOG+NOx credits in accordance with section E.3.1.2.1. A manufacturer that elects to comply with the alternative phase-in schedule for LEV III medium-duty vehicles other than MDPVs in section E.2.3.3 shall calculate fleet average NMOG+NOx credits in accordance with section E.3.1.2.2.

* * * *

3.1.2.2 **Calculation of Fleet Average NMOG+NOx Credits and Debits for Medium-Duty Vehicles Other than MDPVs.**

* * * *

3.1.2.2.2 In 2016 and subsequent model years, a manufacturer that achieves fleet average NMOG+NOx values lower than the fleet average NMOG+NOx requirement for the corresponding model year shall receive credits in units of g/mi NMOG+NOx . A manufacturer with 2016 and subsequent model year fleet average NMOG+NOx values greater than the fleet average requirement for the corresponding model year shall receive debits in units of g/mi NMOG+NOx equal to the amount of negative credits determined by the aforementioned equation. The total g/mi NMOG+NOx credits or debits earned for MDVs 8,501-10,000 lbs. GVWR excluding MDPVs, and for MDVs 10,001-14,000 lbs. GVWR shall be summed together. The resulting amount shall constitute the g/mi NMOG+NOx credits or debits accrued by the manufacturer for the model year. Medium-duty fleet average credits and debits earned in accordance with section E.3.1.2.2 may not be summed together with fleet average credits and debits earned for passenger cars, light-duty trucks, and medium-duty passenger vehicles in accordance with section E.3.1.1.

* * * *

4. LEV III Criteria Pollutant Interim In-Use Compliance Standards.

The following interim in-use compliance standards shall apply for the first two model years that a test group is certified to ~~the~~ LEV III standards that are more stringent than the standards to which the test group was certified in a prior model year, except as noted in section E.4.3.2.

* * * *

4.3 **SFTP Interim In-Use Compliance Emission Standards.**

* * * *

4.3.2 ~~Test groups certified prior to the 2021 model year will be allowed an in-use compliance standard for PM for the first five model years that they are certified to the SFTP PM standard.~~ ~~2020~~2023 and prior model year light-duty and medium-duty passenger vehicle test groups that certify to a LEV III SFTP PM exhaust emission standard in section E.1.2.2.2 may use an in-use compliance standard for SFTP PM regardless of the model year that the test groups first certified to that LEV III SFTP PM standard., ~~and~~ 2022 and prior model year medium-duty vehicle test groups may use an in-use compliance standard for PM for the first two model years that they are certified to ~~the~~ a LEV III SFTP PM exhaust emission standard in section E.1.2.2.4.

* * * *

G. Procedures for Demonstration of Compliance with Emission Standards

*** * * ***

2. §86.1828 Emission data vehicle selection

*** * * ***

2.3 LEV III PM Requirements.

2.3.1 Vehicle Selection. A manufacturer shall select emission data and/or engineering development vehicles each year from PC or LDT test groups and separate emission data and/or engineering development vehicles from MDV test groups according to the requirements in section G.3.6. Within each test group, the vehicle configuration shall be selected which is expected to be worst-case for FTP PM exhaust emission compliance on candidate in-use vehicles.

2.3.2 The same test group shall not be selected in the succeeding two ~~three~~ years unless the manufacturer produces fewer than four test groups that are certified to LEV III PM standards in section E.1.1.2.1. If the manufacturer produces more than four test groups that are certified to LEV III PM standards per model year, the Executive Officer may request LEV III PM testing of specific test groups. If the manufacturer provides a list of the test groups that it will certify to LEV III PM standards for a model year and provides a description of the technologies used on each test group (including the information in section G.2.3.1), the Executive Officer

shall select the test groups subject to LEV III PM testing within a 30 day period after receiving such a list and description. The Executive Officer may revise the test groups selected after the 30 day period if the information provided by the manufacturer does not accurately reflect the test groups actually certified by the manufacturer.

* * * *

3. §86.1829 Durability data and emission data testing requirements; waivers.

* * * *

3.2 §86.1829-15. April 28, 2014. Amend as follows:

* * * *

3.2.2 Subparagraph (c) ~~Delete and replace with~~Add the following: ~~The manufacturer must demonstrate compliance with emission standards at low altitude conditions as described in paragraph (b) of this section.~~ For Otto-cycle vehicles or hybrid vehicles that use Otto-cycle engines, evidence shall be supplied showing that the air/fuel metering system or secondary air injection system is capable of providing sufficient oxygen to theoretically allow enough oxidation to attain the CO emission standards at barometric pressures equivalent to those expected at altitudes ranging from sea level to an elevation of 6000 feet. For fuel injected vehicles or hybrid electric vehicles that use fuel-injected engines, compliance may be demonstrated upon a showing by the manufacturer that the fuel injection system distributes fuel based on mass air flow, rather than volume flow, and is therefore self-compensating. All submitted test proposals will be evaluated on their acceptability by the Executive Officer. As an alternative to the demonstration described above, a manufacturer may demonstrate compliance by testing California vehicle configurations as part of its federal high altitude certification requirements. Engine families that meet all the applicable California low altitude emission standards when tested at the EPA test elevation are deemed to be in compliance. The SFTP standards do not apply to testing at high altitude.

* * * *

3.3~~4~~4 Highway Fuel Economy Test.

The exhaust emissions, including non-methane organic gas emissions, shall be measured from all exhaust emission data vehicles tested in accordance with the federal Highway Fuel Economy Test (HWFET; 40 CFR Part 600 Subpart B or 40 CFR §1066.840, as modified in Part II of these test procedures with the migration provisions of §600.111-08 introduction ~~Part 600, Subpart B~~). The oxides of nitrogen emissions

measured during such tests shall be multiplied by the oxides of nitrogen deterioration factor computed in accordance with 40 CFR §86.1823 and added to the non-methane organic gas emissions. This sum shall be rounded and compared with the NMOG+NOx certification level, as required in section E.1.6. All data obtained pursuant to this paragraph shall be reported in accordance with procedures applicable to other exhaust emission data required pursuant to these procedures. In the event that one or more of the manufacturer's emission data vehicles fail the HWFET standard listed in section E of these test procedures, the manufacturer may submit to the Executive Officer engineering data or other evidence showing that the system is capable of complying with the standard. If the Executive Officer finds, on the basis of an engineering evaluation, that the system can comply with the HWFET standard, he or she may accept the information supplied by the manufacturer in lieu of vehicle test data.

* * * *

H. Certification, Information and Reporting Requirements.

1. §86.1841 Compliance with emission standards for the purpose of certification

* * * *

1.4 **Certification of a Federal Vehicle in California.** Whenever a manufacturer federally-certifies a 2015 or subsequent model-year passenger car, light-duty truck or medium-duty vehicle model to the standards for a particular emissions bin that are more stringent than the standards for an applicable California vehicle emissions category, the equivalent California model may only be certified to (i) the California standards for a vehicle emissions category that are at least as stringent as the standards for the corresponding federal emissions bin, or (ii) the exhaust emission standards to which the federal model is certified. However, where the federal exhaust emission standards for the particular emissions bin and the California standards for a vehicle emissions category are equally stringent, the California model may only be certified to either the California standards for that vehicle emissions category or more stringent California standards. The federal emission bins are those contained Tables S04-1 and S04-2 of 40 CFR section 86.1811-04(c) as adopted February 10, 2000, and in Table 2 of 40 CFR §86.1811.17(b), as adopted April 28, 2014. A California vehicle model is to be treated as equivalent to a federal vehicle model if all of the following characteristics are identical. A federal vehicle shall not qualify as an alternative to a LEV III vehicle.

* * * *

I. In-Use Compliance Requirements and Procedures

1.§86.1845 Manufacturer in-use verification testing requirements.

* * * *

1.1.3 **High Mileage Testing.** Amend subparagraph (c)(2) of 40 CFR §86.1845-04 to read as follows: All test vehicles certified to the emission standards in Part I, section E.1.1.1 of these procedures must have a minimum odometer mileage of 50,000 miles. At least one vehicle of each test group certified to the emission standards in Part I, section E.1.1.1 of these procedures must have a minimum ~~age and~~ odometer mileage of 75,000 for light-duty vehicles and 90,000 miles for medium-duty vehicles. ~~All test~~ At least one vehicle~~s~~ of each test group certified to the emission standards in Part I, section E.1.1.2 of these test procedures must have a minimum ~~age and~~ odometer mileage of 105,000 miles or 75 percent of full useful life mileage. See §86.1838-01(c)(2) for small volume manufacturer mileage requirements.

* * * *

J. Procedural Requirements

1. §86.1848-10 Certification. ~~October 15, 2012~~ April 28, 2014. ~~[No change.]~~ Amend as follows:
   1.1 Amend (c)(5) as follows: The manufacturer must meet the in-use testing and reporting requirements contained in §§86.1845-04, 86.1846-01, and 86.1847-01, as applicable. Failure to meet the in-use testing or reporting requirements shall be considered a failure to satisfy a condition upon which the certificate was issued. A vehicle or truck is considered to be covered by the certificate only if the manufacturer fulfills this condition upon which the certificate was issued.

* * * *

PART II: CALIFORNIA EXHAUST AND PARTICULATE EMISSION TEST PROCEDURES FOR PASSENGER CARS, LIGHT-DUTY TRUCKS AND MEDIUM-DUTY VEHICLES

* * * *

A. 40 CFR Part 86, Subpart B - Emission Regulations for 1977 and Later Model Year New Light-Duty Vehicles and New Light-Duty Trucks and New Otto-Cycle Complete Heavy-Duty Vehicles; Test Procedures.

* * * *

100.3 Certification Fuel Specifications.

100.3.1 California Certification Gasoline Specification.

100.3.1.1 Certification Gasoline Fuel Specifications for LEV II Light-Duty Vehicles and Medium-Duty Vehicles.

Add the following subparagraph which reads: For light-duty vehicles and medium-duty vehicles certified to the LEV II exhaust emission standards set forth in section E.1.1.1, gasoline having the specifications listed below or gasoline having the specifications listed in section 100.3.1.2 or gasoline having the specifications in 40 CFR §1065.710(b) (April 28, 2014) may be used in exhaust and evaporative emission testing as an option to the specifications referred to in §86.113-04(a)(1). If a manufacturer elects to utilize gasoline having the specifications listed below for LEV II vehicles, exhaust emission testing shall be conducted by the manufacturer with gasoline having the specifications listed below, and the Executive Officer shall conduct exhaust emission testing with gasoline having the specifications listed below. If a manufacturer elects to utilize gasoline having the specifications listed in section 100.3.1.2, exhaust emission testing shall be conducted by the manufacturer with gasoline having the specifications listed in section 100.3.1.2, and the Executive Officer shall conduct exhaust emission testing with gasoline having the specifications listed in section 100.3.1.2. If a manufacturer elects to utilize gasoline having the specifications in 40 CFR §1065.710(b) (April 28, 2014), exhaust emission testing shall be conducted by the manufacturer with gasoline having the specifications in 40 CFR §1065.710(b) (April 28, 2014), and the Executive Officer shall conduct exhaust emission testing with gasoline having the specifications in section 40 CFR §1065.710(b) (April 28, 2014). Use of ~~this~~these fuels for evaporative emission testing shall be required as specified in the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles."

* * * *

100.3.1.2 Certification Gasoline Fuel Specifications for LEV III Light-Duty Vehicles and Medium-Duty Vehicles.

Add the following subparagraph which reads: For all light-duty vehicles and medium-duty vehicles certifying to the LEV III standards in section E.1.1.2, gasoline having the specifications listed below may shall be used in exhaust emission testing, as an option to the specifications set forth in 40 CFR §1065.710(b) (April 28, 2014). If a manufacturer elects to utilize gasoline having the specifications listed below,~~and~~ the Executive Officer shall conduct exhaust emission testing with gasoline having the specifications listed below. If a manufacturer elects to utilize gasoline having the specifications set forth in 40 CFR §1065.710(b) (April 28, 2014), the Executive Officer

shall conduct exhaust emission testing with gasoline having the specifications set forth in 40 CFR §1065.710(b) (April 28, 2014). Use of ~~this~~these fuels for evaporative emission testing shall be required as specified in the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles."

California Certification Gasoline Specifications for LEV III Light-Duty Vehicles and Medium-Duty Vehicles		
Fuel Property[a]	**Limit**	**Test Method [b]**
Octane (R+M)/2 [c]	87-88.4; 91 (min)	D 2699-88, D 2700-88
Sensitivity	7.5 (min)	D 2699-88, D 2700-88
Lead	0-0.01g/gal (max); no lead added	§2253.4(c), title 13 CCR
Distillation Range:		§2263, title 13 CCR[d]
10% point	130-150 ^{o}F	
50% point	205-215 ^{o}F	
90% point	310-320 ^{o}F	
EP, maximum	390 ^{o}F	
Residue	2.0 vol. % (max)	
Sulfur	8-11 ppm by wt.	§2263, title 13 CCR
Phosphorous	0.005 g/gal (max)	§2253.4(c), title 13 CCR
RVP	6.9-7.2 psi	§2263, title 13 CCR
Olefins	4.0-6.0 vol. %	§2263, title 13 CCR
Total Aromatic Hydrocarbons	19.5-22.5 vol. %	§2263, title 13 CCR
Benzene	0.6-0.8 vol. %	§2263, title 13 CCR
Multi-substituted Alkyl Aromatic Hydrocarbons	13-15 vol. %[e]	
MTBE	0.05 vol. %	§2263, title 13 CCR
Ethanol	9.~~8~~2-10.~~2~~0 vol. %	§2263, title 13 CCR
Total Oxygen	3.3-3.7 wt. %	§2263, title 13 CCR
Additives	Sufficient to meet requirements of §2257, title 13 CCR	
Copper Corrosion	No. 1	D 130-88
Gum, washed	3.0 mg/100 mL (max)	D 381-86
Oxidation Stability	1000 minutes (min)	D 525-88

Specific Gravity	Report [f]	
Heat of Combustion	Report [f]	
Carbon	Report wt. % [f]	
Hydrogen	Report wt. % [f]	

* * * *

100.3.4 Mixtures of Petroleum and Alcohol Fuels for Flexible Fuel Vehicles.

* * * *

100.3.4.1 **Exhaust emission test fuel for emission-data and durability-data vehicles.** For Otto-cycle or diesel alcohol vehicles and hybrid electric vehicles which use Otto-cycle or diesel alcohol engines, methanol or ethanol fuel used for exhaust emission testing shall meet the applicable specifications set forth in section 2292.2, title 13, CCR, (Specifications for M-85 Fuel Methanol) or section 2292.4 (Specifications for E-85 Fuel Ethanol) as modified by the following.: E-85 that meets the specifications in 40 CFR §1065.725 [April 28, 2014] may be used in exhaust and evaporative emission testing as an option to the E-85 Fuel Ethanol specifications in this subparagraph. If a manufacturer elects to utilize E-85 Fuel Ethanol having the specifications listed below, the Executive Officer shall conduct exhaust emission testing with E-85 Fuel Ethanol having the specifications listed below. If a manufacturer elects to utilize E-85 Fuel Ethanol having the specifications set forth in 40 CFR §1065.725 (April 28, 2014), the Executive Officer shall conduct exhaust emission testing with E-85 Fuel Ethanol having the specifications set forth in 40 CFR §1065.725 (April 28, 2014).

* * * *

California Environmental Protection Agency
AIR RESOURCES BOARD

PROPOSED 15-DAY MODIFICATIONS

CALIFORNIA NON-METHANE ORGANIC GAS TEST PROCEDURES FOR 1993 THROUGH 2016 MODEL YEAR VEHICLES

Adopted: July 12, 1991
Amended: September 22, 1993
Amended: June 24, 1996
Amended: August 5, 1999
Amended: July 30, 2002
Amended: March 22, 2012
Amended: December 6, 2012
Amended: [INSERT DATE OF AMENDMENT]

Emissions Compliance, Automotive Regulations and Science Division
~~Monitoring and Laboratory Division, Southern Laboratory Branch~~
~~Mobile Source Division~~
9528 Telstar Avenue
El Monte, California 91731

NOTE: Mention of any trade name or commercial product does not constitute endorsement or recommendation of this product by the Air Resources Board. The proposed amendments to this document are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions compared to the test procedures as amended December 6, 2012. The modified language now proposed by staff is shown in double underline to indicate additions and ~~double strikeout~~ to indicate deletions. Staff is proposing modifications to limited portions of the original proposal; for some portions of the original proposal for which no modifications are proposed, the text has been omitted and the omission indicated by [No change] or "* * * *." [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: December 23, 2014; Proposed 15-day Changes
Date of Hearing: October 23, 2014

Part B, Determination of Non-Methane Hydrocarbon Mass Emissions by Flame Ionization Detection

* * * *

5. NMHC MASS EMISSION PER TEST PHASE

* * * *

5.2 **All Vehicles**

* * * *

5.2.5 The density of the NMHC is determined using the carbon:hydrogen ratio of the fuel, $C_xH_yO_z$, according to the following equation:

~~$$NMHC_{dens} = (x * 12.01115 + y * 1.00797)(g/mole) * \left(\frac{28.316847\ liter/ft^3}{24.0547\ liter/mole}\right)$$~~

$$NMHC_{dens} = (x * 12.0107 + y * 1.00794)(g/mole) * \left(\frac{28.316847\ liter/ft3}{24.055\ liter/mole}\right)$$

where: 12.0107~~115~~ = atomic weight of carbon
1.00794~~7~~ = atomic weight of hydrogen

except when using any gasoline-based fuel, including Phase 2 gasoline and E85 fuel, for which the $NMHC_{dens}$ is defined as 16.33.

* * * *

Part D, Determination of C_2 to C_5 Hydrocarbons in Automotive Source Samples by Gas Chromatography, Method 1002

* * * *

3. **INTERFERENCES AND LIMITATIONS**

* * * *

3.2 Sample bag material should not cause sample loss or contamination.

3.3~~2~~ To maximize sample integrity, sample bags should not leak or be exposed to bright light or excessive heat. Sampling bags must be shielded from direct sunlight to avoid photochemically induced reactions of any reactive hydrocarbons. The compound 1,3-butadiene, resulting mostly during cold-start testing, is unstable. Therefore all cold-start samples must be analyzed within 8 hours; all other samples must be analyzed within 24 hours, although analysis within 8 hours is recommended.

3.3.1 As allowed by Section 4.1, other types of sample collection materials or containers may be used. If so, sample stability must be investigated and an appropriate maximum allowable sample holding time set.

4. INSTRUMENTS AND APPARATUS

4.1 Sample collection bags, nominally 5 to 10 liters in capacity and equipped with quick-connect fittings, are typically used to contain the samples. Sample collection bags may be made of Tedlar® (polyvinylfluoride, or PVF), 2 mil in thickness, or of Kynar® or Solef® (polyvinylidenefluoride, or PVDF), each 4 mil in thickness. Other sample bag material or sample collection containers, such as nickel-coated stainless steel canisters, may be used, provided they are made of non-reactive material and do not cause sample loss or contamination.

4.2 For manual sub-sampling into a GC, a ground glass syringe is used to transfer gaseous samples from ~~Tedlar~~ sample bags to the GC sample inlet. For automated systems, a sample loop is used to transfer gaseous samples from the ~~Tedlar~~ sample bag to the sample inlet of the GC. Sample aliquot size is chosen based on considerations of instrument sensitivity and/or linearity.

* * * *

8. QUALITY CONTROL

* * * *

8.5 Duplicates - A duplicate analysis of one sample is performed at least once per analysis day. The relative percent difference (RPD) is calculated for each duplicate run:

$$\text{RPD (\%)} = \frac{|\text{Difference between duplicate and original measurements}|}{\text{Average of duplicate and orinal measurements}} \times 100$$

~~RPD (%) = |Difference between duplicate and original measurements| x 100~~

~~Average of duplicate and original measurements~~

* * * *

Part E, Determination of C_6 to C_{12} Hydrocarbons in Automotive Source Samples by Gas Chromatography, Method No. 1003

* * * *

3. INTERFERENCES AND LIMITATIONS

* * * *

3.2 Sample bag material should not cause sample loss or contamination.

3.3~~2~~ The concentration of hydrocarbons in the range of interest is stable for at least 24 hours in the Tedlar®, Kynar®, or Solef® sampling bags, provided the sample bags do not leak and are not exposed to bright light or excessive heat. Sampling bags must be shielded from direct sunlight to avoid photochemically induced reactions of any reactive hydrocarbons. Samples must be analyzed within 24 hours.

3.3.1 As allowed by Section 4.1, other types of sample collection materials or containers may be used. If so, sample stability must be investigated and an appropriate maximum allowable sample holding time set.

4. **INSTRUMENTATION AND APPARATUS**

4.1 Sample collection bags, nominally 5 to 10 liters in capacity and equipped with quick-connect fittings, are typically used to contain the samples. Sample collection bags may be made of Tedlar® (polyvinylfluoride, or PVF), 2 mil in thickness, or of Kynar® or Solef® (polyvinylidenefluoride, or PVDF), each 4 mil in thickness. Other sample bag material or sample collection containers, such as nickel-coated stainless steel canisters, may be used, provided they are made of non-reactive material and do not cause sample loss or contamination.

4.2 For manual sub-sampling into a GC, a ground glass syringe is used to transfer gaseous samples from ~~Tedlar~~ sample bags to the GC sample inlet. For automated systems, a sample loop is used to transfer gaseous samples from the ~~Tedlar~~ sample bag to the sample inlet of the GC. Sample aliquot size is chosen based on considerations of instrument sensitivity and/or linearity.

* * * *

Part F, Determination of Aldehyde and Ketone Compounds in Automotive Source Samples by High Performance Liquid Chromatography, Method No. 1004

* * * *

3. **INTERFERENCES AND LIMITATIONS**

* * * *

3.3 The presence of NOx in exhaust samples depletes DNPH in the cartridges. Laboratories should develop criteria to validate test results by ensuring that enough DNPH is left to trap the carbonyl compounds, particularly in samples with high NOx levels.

* * * *

3.3.2 Comparison of DNPH area counts in the sample to those in the blank show the approximate percentage of DNPH remaining in the sample cartridge:

$$\%\ \text{of excess DNPH in sample cartridge} = \frac{\text{DNPH area counts, sample}}{\text{DNPH area counts, blank}} \times 100$$

~~$$\%\ \text{of excess DNPH in sample cartridge} = \frac{\text{DNPH area counts, sample}}{\text{DNPH area counts, blank}}$$~~

* * * *

Part G, Determination of NMOG Mass Emissions

* * * *

3. **DILUTION FACTOR AND NMHC MASS EMISSION CALCULATION**

* * * *

3.2 The density of the NMHC is determined using the carbon:hydrogen ratio of the fuel, $C_xH_yO_z$, according to the following equation:

~~$$NMHC_{dens} = (x * 12.01115 + y * 1.00797)(g/mole) * \left(\frac{28.316847\ liter/ft^3}{24.0547\ liter/mole}\right)$$~~

$$NMHC_{dens} = (x * 12.0107 + y * 1.00794)(g/mole) * \left(\frac{28.316847 liter/ft^3}{24.0547 liter/mole}\right)$$

where: 12.0107~~115~~ = atomic weight of carbon
1.00794~~7~~ = atomic weight of hydrogen

except when using any gasoline-based fuel, including Phase 2 gasoline and E85 fuel, for which the $NMHC_{dens}$ is defined as 16.33.

* * * *

4. SPECIATED HYDROCARBON MASS EMISSIONS CALCULATION

4.1 INTRODUCTION

Vehicular exhaust emissions are measured according to the FTP [Ref. 1]. For each of the three phases of the FTP, a sample collection bag, nominally 5 to 10 liters in capacity, is used to collect a dilute exhaust sample. Sample collection bags may be made of Tedlar® (polyvinylfluoride, or PVF), 2 mil in thickness, or of Kynar® or Solef® (polyvinylidenefluoride, or PVDF), each 4 mil in thickness. A fourth bag is used to collect a composite dilution air (background) sample from all three phases of the FTP. Since PVF and PVDF films contain plasticizer or volatile organic components, all of the films are conditioned in a vented oven at 250°F for 16 hours before made into sample bags. Other sample bag material or sample collection containers, such as nickel-coated stainless steel canisters, may be used, provided they are made of non-reactive material and do not cause sample loss or contamination. All bag samples are analyzed according to Method No. 1002 (Part D of these test procedures) and Method No. 1003 (Part E of these test procedures) to determine the dilute exhaust and dilution air concentrations of individual hydrocarbon compounds. The measured hydrocarbon compound concentrations are used in the following equations to calculate the weighted mass emissions of each hydrocarbon compound.

* * * *

4.4. SAMPLE CALCULATION

4.4.1 Exhaust emissions from a gasoline vehicle are collected in three dilute exhaust sample bags and one dilution air (background) sample bag during the FTP. Gas chromatography is used to determine the benzene concentration of each bag sample. Calculate the weighted benzene mass emissions based on the following data:

* * * *

For Phase 1:

* * * *

Mol. Wt. of C_6H_6 = (6 * 12.0107~~115~~) + (6 * 1.00794~~7~~)
= 78.1118~~472~~ g/mole

HC_{dens} = (Mol. Wt. * conversion of liter to ft^3) / (Mol. Vol.)
= (78.1118~~472~~ g/mole * 28.3168 liter/ft^3) / 24.055 liter/mole
= 91.951~~2~~ g/ft^3

$HC_{mass\ n}$ = (HC_{conc} * HC_{dens} * VMIX * 10^{-6}) / (Carbon No.)

$HC_{mass\ 1}$ = (477 ppbC * 91.951~~2~~ g/ft^3 * 2846 ft^3 * 10^{-6}) / 6
= 20.8 mg

* * * *

5. ALCOHOL MASS EMISSIONS CALCULATION

* * * *

5.4 SAMPLE CALCULATION

5.4.1 Alcohol emissions from an E85 fueled vehicle are collected in three sets of dilute exhaust impingers and one set of dilution air impingers during the FTP. Gas chromatography is used to determine the alcohol concentration in each impinger. This is the same vehicle test as the example in section 3.3. Calculate the weighted ethanol mass emissions based on the following data, along with the data presented in section 3.3:

* * * *

Ethanol

For Phase 1:

* * * *

Mol. Wt. of C_2H_5OH = (2 * 12.0107~~115~~) + (6 * 1.00794~~7~~) + (1 * 15.9994)
= 46.06844~~952~~ g/mole

* * * *

ROH_e = ($Imass_e$ / $Ivol_e$) * (Mol. Vol. / Mol. Wt.)
= (76.35 µg / 8.15 liter) * (24.055 liter/mole / 46.06844~~952~~ g/mole)
= 4.89 ppm

* * * *

ROH_d = ($Imass_d$ / $Ivol_d$) * (Mol. Vol. / Mol. Wt.)
= (0 µg / 31.46 liter) * (24.055 liter/mole / 46.06844~~952~~ g/mole)
= 0 ppm

* * * *

ROH_{dens} = (Mol. Wt. * conversion of liter to ft^3) / (Mol. Vol.)
= (46.06844~~952~~ g/mole * 28.3168 liter/ft^3) / 24.055 liter/mole
= 54.230307~~808~~ g/ft^3

* * * *

6. CARBONYL MASS EMISSIONS CALCULATIONS

* * * *

6.4. SAMPLE CALCULATION

6.4.1 Carbonyl emissions from an E85 vehicle are collected in three sets of dilute exhaust impingers and one set of dilution air impingers during the FTP. HPLC is used to determine the carbonyl mass in each impinger. This is the same vehicle test as the example in section 3.3. Calculate the weighted formaldehyde and acetaldehyde mass emissions based on the following data, along with the data presented in section 3.3:

* * * *

Formaldehyde

For Phase 1:

* * * *

Mol. Wt. of HCHO = (1 * 12.0107~~115~~) + (2 * 1.00794~~7~~) + (1 * 15.9994)
= 30.02608~~8~~ g/mole

* * * *

RHO_e = ($Imass_e$ / $Ivol_e$) * (Mol. Vol. / Mol. Wt.)
= (1.70 µg / 8.44 liter) * (24.055 liter/mole / 30.026068~~68~~ g/mole)
= 0.16 ppm

* * * *

RHO_d = ($Imass_d$ / $Ivol_d$) * (Mol. Vol. / Mol. Wt.)
= (0.026 µg / 8.20 liter) * (24.055 liter/mole / 30.026068~~68~~ g/mole)
= 0.0025481~~8~~ ppm

* * * *

RHO_{dens} = (Mol. Wt. * conversion of liter to ft^3) / (Mol. Vol.)
= (30.026068~~68~~ g/mole * 28.316 liter/ft^3) / 24.055 liter/mole
= 35.35 g/ft^3

* * * *

California Environmental Protection Agency
AIR RESOURCES BOARD

PROPOSED 15-DAY MODIFICATIONS

CALIFORNIA NON-METHANE ORGANIC GAS TEST PROCEDURES FOR 2017 AND SUBSEQUENT MODEL YEAR VEHICLES

Adopted: [INSERT DATE OF ADOPTION]

Emissions Compliance, Automotive Regulations and Science Division
~~Monitoring and Laboratory Division, Southern Laboratory Branch~~
~~Mobile Source Division~~
9528 Telstar Avenue
El Monte, California 91731

NOTE: Mention of any trade name or commercial product does not constitute endorsement or recommendation of this product by the Air Resources Board. The following text contains staff's suggested modifications to these test procedures as originally proposed September 2, 2014. Modifications to the originally proposed language made available in connection with this "15-Day Notice" are shown in double underline to indicate additions and ~~double strikeout~~ to indicate deletions compared to the test procedures as proposed September 2, 2014. Staff is proposing modifications to limited portions of the original proposal; for some portions where no modifications are proposed the text has been omitted and the omission indicated by "* * * *" or [No change].

Date of Release: December 23, 2014; Proposed 15-day Changes
Date of Hearing: October 23, 2014

* * * *

Part A

GENERAL APPLICABILITY AND REQUIREMENTS

* * * *

2. This document sets forth the analysis and calculation procedures that shall be performed to determine NMOG mass emissions. The document consists of the following parts:

* * * *

G. Determination of NMOG ~~Mass~~ Emissions

* * * *

3. The analyses specified in the table below shall be performed to determine mass emission rates of NMOG in grams per mile (g/mi) or milligrams per mile (mg/mi) for vehicles operated on the listed fuel:

Fuel	NMHC by FID	Alcohols	Carbonyls
Alcohol	X	X	X
CNG	X		X
Diesel	X		
Gasoline	X		X
LPG	X		X

Note: Alternatives to direct measurement of carbonyls under certain conditions are presented in 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," Section D.1.10 ~~40 CFR 1066, Section 1066.635, "NMOG determination," Sections (c) through (f) [Ref. 1]~~.

The specified analyses shall be performed in accordance with the following parts of this document:

NMHC by FID--	Part B.	Determination of Non-Methane Hydrocarbon Mass Emissions by Flame Ionization Detection
NMHC by GC--	Part D.	Determination of C_2 to C_5 Hydrocarbons in Automotive Source Samples by Gas Chromatography (Method No. 1002); and
	Part E.	Determination of C_6 to C_{12} Hydrocarbons in Automotive Source Samples by Gas Chromatography (Method No. 1003)
CARBONYLS--	Part F.	Determination of Aldehyde and Ketone Compounds in Automotive Source Samples by High Performance Liquid Chromatography (Method No. 1004)
ALCOHOLS --	Part C.	Determination of Alcohols in Automotive Source Samples by Gas Chromatography (Method No. 1001)

Note: NMHC by GC is included for research purposes only, should any lab wish to speciate the hydrocarbons in the emissions. Its use is not mandated by these test procedures.

* * * *

Part C

DETERMINATION OF ALCOHOLS IN AUTOMOTIVE SOURCE SAMPLES BY GAS CHROMATOGRAPHY

METHOD NO. 1001

* * * *

5. **REAGENTS AND MATERIALS**

* * * *

5.5 Gas requirements.

5.5.1 Air shall contain less than 50 ppbC hydrocarbon contamination ~~be "Zero" grade (<1 ppmC total hydrocarbon contamination) or better~~.

* * * *

Part D

DETERMINATION OF C_2 TO C_5 HYDROCARBONS IN AUTOMOTIVE SOURCE SAMPLES BY GAS CHROMATOGRAPHY

METHOD NO. 1002

1. **INTRODUCTION**

* * * *

1.2 This test method is included for research purposes only, should any lab wish to speciate the hydrocarbons in the emissions. Its use is not mandated by these test procedures.

1.3 The "target" hydrocarbons (compounds of interest) that ~~shall be~~ are typically analyzed and reported by this method and Method 1003 are listed in Appendix 1. All compounds on this list, when measured in concentrations above the LOD, ~~shall~~ should be measured and reported ("targeted") by either Method 1002 or Method 1003. Each laboratory should divide the list into light-end (Method 1002) and mid-range (Method 1003) hydrocarbons in the manner that best suits the laboratory instrumentation. All compounds on the list not targeted by Method 1002 ~~must~~ should be targeted by Method 1003.

1.4~~2~~ Other applicable forms of instrumentation and analytical techniques ~~may~~ can be used. For optimal results, an alternative method should ~~if shown to~~ yield results equivalent to those specified in this procedure~~ and if approved in advance by the Executive Officer of the Air Resources Board~~.

1.5~~3~~ All definitions and abbreviations are contained in Appendix 2 of these test procedures.

* * * *

3. **INTERFERENCES AND LIMITATIONS**

* * * *

3.2 Sample bag material should not cause sample loss or contamination.

3.3~~2~~ To maximize sample integrity, sample bags should not leak or be exposed to bright light or excessive heat. Sampling bags must be shielded from direct sunlight to avoid photochemically induced reactions of any reactive

hydrocarbons. The compound 1,3-butadiene, resulting mostly during cold-start testing, is unstable. Therefore all cold-start samples must be analyzed within 8 hours; all other samples must be analyzed within 24 hours, although analysis within 8 hours is recommended.

3.3.1 As allowed by Subsection 4.1, other types of sample collection materials or containers may be used. If so, sample stability must be investigated and an appropriate maximum allowable sample holding time set.

4. INSTRUMENTS AND APPARATUS

4.1 Sample collection bags, nominally 5 to 10 liters in capacity and equipped with quick-connect fittings, are typically used to contain the samples. Sample collection bags may be made of Tedlar® (polyvinylfluoride, or PVF), 2 mil in thickness, or of Kynar® or Solef® (polyvinylidenefluoride, or PVDF), each 4 mil in thickness. Other sample bag material or sample collection containers, such as nickel-coated stainless steel canisters, may be used, provided they are made of non-reactive material and do not cause sample loss or contamination.

4.2 For manual sub-sampling into a GC, a ground glass syringe is used to transfer gaseous samples from ~~Tedlar~~ sample bags to the GC sample inlet. For automated systems, a sample loop is used to transfer gaseous samples from the ~~Tedlar~~ sample bag to the sample inlet of the GC. Sample aliquot size is chosen based on considerations of instrument sensitivity and/or linearity.

* * * *

5. REAGENTS AND MATERIALS

* * * *

5.3 Air shall contain less than 50 ppbC hydrocarbon contamination ~~be "Zero" grade (<1 ppmC total hydrocarbon contamination) or better~~.

* * * *

8. QUALITY CONTROL

* * * *

8.5 Duplicates - A duplicate analysis of one sample is performed at least once per analysis day. The relative percent difference (RPD) is calculated for each duplicate run:

$$\text{RPD}\ (\%) = \frac{|\text{Difference between duplicate and original measurements}|}{\text{Average of duplicate and orinal measurements}} \times 100$$

~~RPD (%) = |Difference between duplicate and original measurements| x 100~~

~~Average of duplicate and original measurements~~

For each compound specified in Section 5.6, the allowable RPD depends on the average concentration level for the duplicate runs, as shown in the following table:

Average Measurement for the Duplicate Runs			Allowable RPD (%)
1 to 10	times	LOD	100
10 to 20	"	"	30
20 to 50	"	"	20
Greater than 50	"	"	15

If the results of the duplicate analyses do not meet these criteria for all compounds specified in Section 5.6, the sample may be reanalyzed. If reanalysis is not feasible or if the criteria are still not met on reanalysis, all sample results for that analysis day are invalid.

* * * *

Part E

DETERMINATION OF C_6 TO C_{12} HYDROCARBONS IN AUTOMOTIVE SOURCE SAMPLES BY GAS CHROMATOGRAPHY

METHOD NO. 1003

1. INTRODUCTION

* * * *

1.2 This test method is included for research purposes only, should any lab wish to speciate the hydrocarbons in the emissions. Its use is not mandated by these test procedures.

1.3 The target hydrocarbons (compounds of interest) that ~~shall be~~ are typically analyzed and reported by this method and Method 1002 are listed in Appendix 1. All compounds on this list, when measured in concentrations above the LOD,

~~shall~~ should be measured and reported ("targeted") by either Method 1002 or Method 1003. Each laboratory should divide the list into light-end (Method 1002) and mid-range (Method 1003) hydrocarbons in the manner that best suits the laboratory instrumentation. All compounds on the list not targeted by Method 1003 ~~must~~ should be targeted by Method 1002.

1.4~~2~~ Other applicable forms of instrumentation and analytical techniques ~~may~~ can be used. For optimal results, an alternative method should ~~if shown to~~ yield results equivalent to those specified in this procedure~~ and if approved in advance by the Executive Officer of the Air Resources Board~~.

1.5~~3~~ All definitions and abbreviations are contained in Appendix 2 of these test procedures.

* * * *

3. INTERFERENCES AND LIMITATIONS

* * * *

3.2 Sample bag material should not cause sample loss or contamination.

3.3~~2~~ The concentration of hydrocarbons in the range of interest is stable for at least 24 hours in the Tedlar®, Kynar®, or Solef® sampling bags, provided the sample bags do not leak and are not exposed to bright light or excessive heat. Sampling bags must be shielded from direct sunlight to avoid photochemically induced reactions of any reactive hydrocarbons. Samples must be analyzed within 24 hours.

3.3.1 As allowed by Section 4.1, other types of sample collection materials or containers may be used. If so, sample stability must be investigated and an appropriate maximum allowable sample holding time set.

4. INSTRUMENTATION AND APPARATUS

4.1 Sample collection bags, nominally 5 to 10 liters in capacity and equipped with quick-connect fittings, are typically used to contain the samples. Sample collection bags may be made of Tedlar® (polyvinylfluoride, or PVF), 2 mil in thickness, or of Kynar® or Solef® (polyvinylidenefluoride, or PVDF), each 4 mil in thickness. Other sample bag material or sample collection containers, such as nickel-coated stainless steel canisters, may be used, provided they are made of non-reactive material and do not cause sample loss or contamination.

4.2 For manual sub-sampling into a GC, a ground glass syringe is used to transfer gaseous samples from ~~Tedlar~~ sample bags to the GC sample inlet. For

automated systems, a sample loop is used to transfer gaseous samples from the ~~Tedlar~~ sample bag to the sample inlet of the GC. Sample aliquot size is chosen based on considerations of instrument sensitivity and/or linearity.

* * * *

5. **REAGENTS AND MATERIALS**

* * * *

5.3 Air shall contain less than 50 ppbC hydrocarbon contamination ~~be "Zero" grade (<1 ppmC total hydrocarbon contamination) or better~~.

* * * *

Part F

DETERMINATION OF ALDEHYDE AND KETONE COMPOUNDS IN AUTOMOTIVE SOURCE SAMPLES BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

METHOD NO. 1004

* * * *

3. **INTERFERENCES AND LIMITATIONS**

* * * *

3.3 The presence of NOx in exhaust samples depletes DNPH in the cartridges. Laboratories should develop criteria to validate test results by ensuring that enough DNPH is left to trap the carbonyl compounds, particularly in samples with high NOx levels.

* * * *

3.3.2 Comparison of DNPH area counts in the sample to those in the blank show the approximate percentage of DNPH remaining in the sample cartridge:

$$\%\ \text{of excess DNPH in sample cartridge} = \frac{\text{DNPH area counts, sample}}{\text{DNPH area counts, blank}} \times 100$$

~~% of excess DNPH in sample cartridge = $\frac{\text{DNPH area counts, sample}}{\text{DNPH area counts, blank}}$~~

* * * *

Part G

DETERMINATION OF NMOG EMISSIONS

1. INTRODUCTION

* * * *

1.3 This section addresses emissions, in concentration units, of each test phase. Calculations to use those concentrations to determine NMOG mass emissions for FTP testing are given in 40 CFR Part 1066, Section 1066.635~~935~~, "NMOG determination."

* * * *

2. NMOG WEIGHTED MASS EMISSIONS

2.1 Non-methane hydrocarbon weighted mass emissions ($NMHC_{wm}$) can be determined by either FID or GC. The GC method is included for research purposes only, should any lab wish to speciate the hydrocarbons in the emissions. Its use is not mandated by these test procedures.

* * * *

3. SPECIATED HYDROCARBON EMISSIONS CALCULATION

3.1 INTRODUCTION

Vehicular exhaust emissions are measured according to the FTP [Ref. 1, 2 and/or 3, as applicable]. For each of the three phases of the FTP, a sample collection bag, nominally 5 to 10 liters in capacity, is used to collect a dilute exhaust sample. Sample collection bags may be made of Tedlar® (polyvinylfluoride, or PVF), 2 mil in thickness, or of Kynar® or Solef® (polyvinylidenefluoride, or PVDF), each 4 mil in thickness. A fourth bag is used

to collect a composite dilution air (background) sample from all three phases of the FTP. Since PVF and PVDF films contain plasticizer or volatile organic components, all of the films are conditioned in a vented oven at 250°F for 16 hours before made into sample bags. Other sample bag material or sample collection containers, such as nickel-coated stainless steel canisters, may be used, provided they are made of non-reactive material and do not cause sample loss or contamination. All bag samples are analyzed according to Method No. 1002 (Part D of these test procedures) and Method No. 1003 (Part E of these test procedures) to determine the dilute exhaust and dilution air concentrations of individual hydrocarbon compounds. The measured hydrocarbon compound concentrations are used in the following equations to calculate the emissions of each hydrocarbon compound.

3.2 HC EMISSIONS CALCULATION PER TEST PHASE

3.2.1 For each hydrocarbon measured, the equations below and in 40 CFR Part 1066 are used to calculate the hydrocarbon mass emission over the test interval.

* * * *

3.2.1.3 The dilution factor, DF, is calculated according to 40 CFR Part 1066, Section 1066.610, equation 1066-610-2.

* * * *

3.2.2 The individual hydrocarbons are summed:

$$m_{NMHC} = \sum_{i}^{N} HC$$

* * * *

3.3 SAMPLE CALCULATION

3.3.1 Exhaust emissions from a gasoline vehicle are collected in three dilute exhaust sample bags and one dilution air (background) sample bag during the FTP. Gas chromatography is used to determine the benzene concentration of each bag sample. Calculate the Phase 1 benzene emissions based on the following data:

* * * *

For Phase 1:

* * * *

Mol. Wt. of C_6H_6 = (6 * 12.0107~~115~~) + (6 * 1.00794~~7~~)
= 78.1118~~472~~ g/mole

HC_{dens} = (Mol. Wt. * conversion of liter to ft^3) / (Mol. Vol.)
= (78.1118~~472~~ g/mole * 28.3168 liter/ft^3) / 24.055 liter/mole
= 91.951~~2~~ g/ft^3

* * * *

4. ALCOHOL EMISSIONS CALCULATION

* * * *

4.3 SAMPLE CALCULATION

4.3.1 Alcohol emissions from an E85 fueled vehicle are collected in three sets of dilute exhaust impingers and one set of dilution air impingers during the FTP. Gas chromatography is used to determine the alcohol concentration in each impinger. This is the same vehicle test as the example in Section 3.3. Calculate the Phase 1 ethanol emissions based on the following data, along with the data presented in Section 3.3:

* * * *

Ethanol

For Phase 1:

* * * *

Mol. Wt. of C_2H_5OH = (2 * 12.0107~~115~~) + (6 * 1.00794~~7~~) + (1 * 15.9994)
= 46.0684~~952~~ g/mole

* * * *

ROH_e = ($Imass_e$ / $Ivol_e$) * (Mol. Vol. / Mol. Wt.)
= (76.35 µg / 8.15 liter) * (24.055 liter/mole / 46.0684~~952~~ g/mole)
= 4.89 ppm

* * * *

ROH_d = ($Imass_d$ / $Ivol_d$) * (Mol. Vol. / Mol. Wt.)
= (0 µg / 31.46 liter) * (24.055 liter/mole / 46.0684~~4952~~ g/mole)
= 0 ppm

* * * *

ROH_{dens} = (Mol. Wt. * conversion of liter to ft^3) / (Mol. Vol.)
= (46.0684~~4952~~ g/mole * 28.3168 liter/ft^3) / 24.055 liter/mole
= 54.2303~~07808~~ g/ft^3

* * * *

5. CARBONYL EMISSIONS CALCULATIONS

* * * *

5.3 SAMPLE CALCULATION

5.3.1 Carbonyl emissions from an E85 vehicle are collected in three sets of dilute exhaust impingers and one set of dilution air impingers during the FTP. HPLC is used to determine the carbonyl mass in each impinger. This is the same vehicle test as the example in Section 3.3. Calculate the Phase 1 formaldehyde emissions based on the following data, along with the data presented in Section 3.3:

* * * *

Formaldehyde

For Phase 1:

* * * *

Mol. Wt. of HCHO = (1 * 12.0107~~115~~) + (2 * 1.00794~~7~~) + (1 * 15.9994)
= 30.0260~~8~~ g/mole

* * * *

RHO_e = ($Imass_e$ / $Ivol_e$) * (Mol. Vol. / Mol. Wt.)
= (1.70 µg / 8.44 liter) * (24.055 liter/mole / 30.02606~~8~~ g/mole)
= 0.16 ppm

* * * *

RHO_d = ($Imass_d$ / $Ivol_d$) * (Mol. Vol. / Mol. Wt.)
= (0.026 µg / 8.20 liter) * (24.055 liter/mole / 30.02<u>60</u>~~68~~ g/mole)
= 0.0025<u>4</u>~~8~~ ppm

* * * *

RHO_{dens} = (Mol. Wt. * conversion of liter to ft^3) / (Mol. Vol.)
= (30.02<u>60</u>~~68~~ g/mole * 28.3168 liter/ft^3) / 24.055 liter/mole
= 35.35 g/ft^3

* * * *

State of California
AIR RESOURCES BOARD

PROPOSED 15-DAY MODIFICATIONS

CALIFORNIA EVAPORATIVE EMISSION STANDARDS AND TEST PROCEDURES FOR 2001 AND SUBSEQUENT MODEL MOTOR VEHICLES

Adopted: August 5, 1999
Amended: June 22, 2006
Amended: October 17, 2007
Amended: December 2, 2009
Amended: September 27, 2010
Amended: March 22, 2012
Amended: December 6, 2012
Amended: [INSERT DATE OF AMENDMENT]

Note: The following text contains staff's suggested modifications to these test procedures as originally proposed September 2, 2014. Unless otherwise indicated below, the text of the originally proposed amendments to this document are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions compared to the test procedures as amended December 6, 2012. The modified language now proposed by staff is shown in double underline to indicate additions and ~~double strikeout~~ to indicate deletions. Staff is proposing modifications to limited portions of the original proposal; for some portions of the original proposal for which no modifications are proposed, the text has been omitted and the omission indicated by [No change] or "* * * *." [No change] also indicates proposed federal provisions that are also proposed for incorporation herein without change.

* * * *

Date of Release: December 23, 2014; Proposed 15-day Changes
Date of Hearing: October 23, 2014

CALIFORNIA EVAPORATIVE EMISSION STANDARDS AND TEST PROCEDURES FOR 2001 AND SUBSEQUENT MODEL MOTOR VEHICLES

* * * *

PART I. GENERAL CERTIFICATION REQUIREMENTS FOR EVAPORATIVE EMISSIONS

A. 40 CFR §86.1801-01 Applicability.

* * * *

1.7 ~~For instances in this document where an option is provided to follow provisions from either Title 40 CFR Part 86 or Title 40 CFR Part 1066, the migration schedule set forth in Title 40 CFR 86.101(b) (April 28, 2014) shall apply.~~ If a manufacturer opts to use 40 CFR Part 1066 per the migration schedule set forth in 40 CFR 86.101 (b), in lieu of 40 CFR Part 86, the California-specific 40 CFR Part 86 modifications contained herein shall still apply.

* * * *

E. Emission Standards

1. Evaporative Emission Standards for 2001 and Subsequent Model Year Vehicles Other Than Motorcycles.

* * * *

(e) For 2015 and subsequent model motor vehicles, the following evaporative emission requirements apply:

* * * *

(ii) Phase-In Schedule. For each model year, a manufacturer shall certify, at a minimum, the specified percentage of its vehicle fleet to the evaporative emission standards set forth in section I.E.1.(e)(i), according to the implementation schedule set forth below. For the purpose of this section I.E.1.(e)(ii), the manufacturer's vehicle fleet consists of the vehicles produced and delivered for sale by the manufacturer in California that are subject to the emission standards in section I.E.1.(e)(i). All 2015 through 2022 model motor vehicles that are not subject to these standards pursuant to the phase-in schedule shall comply with the requirements for 2004 through 2014 model motor vehicles, as described in section

I.E.1.(d), or the optional zero-fuel evaporative emission standards for 2001 through 2014 model motor vehicles, as described in section I.E.1.(c).

Model Years	*Minimum Percentage of Vehicle Fleet*[(1)(2)]
2015, 2016, and 2017	Average of vehicles certified to section I.E.1.(c) in model years 2012, 2013, and 2014[(3)(4)]
2018 and 2019	60
2020 and 2021	80
2022 and subsequent	100

* * * *

State of California
AIR RESOURCES BOARD

PROPOSED 15-DAY MODIFICATIONS

CALIFORNIA REFUELING EMISSION STANDARDS AND TEST PROCEDURES FOR 2001 AND SUBSEQUENT MODEL MOTOR VEHICLES

Adopted: August 5, 1999
Amended: September 5, 2003
Amended: June 22, 2006
Amended: October 17, 2007
Amended: December 2, 2009
Amended: September 27, 2010
Amended: March 22, 2012
Amended: [INSERT DATE OF AMENDMENT]

Note: The following text contains staff's suggested modifications to these test procedures as originally proposed September 2, 2014. Unless otherwise indicated below, the text of the originally proposed amendments to this document are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions compared to the test procedures as amended March 22, 2012. The modified language now proposed by staff is shown in double underline to indicate additions and ~~double strikeout~~ to indicate deletions. Staff is proposing modifications to limited portions of the original proposal; for some portions of the original proposal for which no modifications are proposed, the text has been omitted and the omission indicated by [No change] or "* * * *." [No change] also indicates proposed federal provisions that are also proposed for incorporation herein without change.

Date of Release: December 23, 2014; Proposed 15-day Changes
Date of Hearing: October 23, 2014

* * * *

CALIFORNIA REFUELING EMISSION STANDARDS AND TEST PROCEDURES FOR 2001 AND SUBSEQUENT MODEL MOTOR VEHICLES

The provisions of Title 40, Code of Federal Regulations (CFR), Part 86, Subparts B (as adopted or amended by the U.S. Environmental Protection Agency (U.S. EPA) on the date listed) and S (as adopted on May 4, 1999, or as last amended on such other date set forth next to the 40 CFR Part 86 section title listed below) to the extent they pertain to the testing and compliance of vehicle refueling emissions for passenger cars, light-duty trucks and medium-duty vehicles, are hereby adopted as the "California Refueling Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles," with the following exceptions and additions.

Subpart S Requirements

I. General Certification Requirements for Refueling Emissions

A. Applicability

* * * *

2. For general certification purposes, the requirements set forth 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;" 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;" ~~the "California Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes;"~~ the "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;" the "California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes;" and the "California Evaporative Emission Standards and Test Procedures For 2001 and Subsequent Model Motor Vehicles," shall apply, except as otherwise noted in these test procedures.

* * * *

9. If a manufacturer opts to use 40 CFR Part 1066 per the migration schedule set forth in 40 CFR 86.101 (b), in lieu of 40 CFR Part 86, the California-specific 40 CFR Part 86 modifications contained herein shall still apply.

* * * *

B. Definitions, Acronyms, Terminology

1. These test procedures incorporate by reference the definitions set forth in the Code of Federal Regulations; and, the definitions as set forth 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," 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," ~~in the "California Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes,"~~ the "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," the "California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," and in the "California Evaporative Emission Standards and Test Procedures For 2001 and Subsequent Model Motor Vehicles."

* * * *

Subpart B - Emission Regulations for 1977 and Later Model Year New Light-Duty Vehicles and New Light-Duty Trucks; Test Procedures

40 CFR §§ 86.101 through 86.145 and Appendix I (UDDS Schedule) of this Subpart B, as incorporated by reference and amended 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;" 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;" ~~the "California Exhaust Emission Standards and Test Procedures for~~

~~2009 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes;"~~ the "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;" the "California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes;" and~~,~~ the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles," are hereby incorporated by reference herein.

* * * *

II. Refueling Emissions Test Procedures

* * * *

B. Refueling Emissions

* * * *

4. §86.153-98 Vehicle and canister preconditioning; refueling test ~~[December 8, 2005]~~ [April 28, 2014]

4.1. Amend subparagraph (a) to include: The vehicle preconditioning drive for 2012 and later model-year off-vehicle charge capable hybrid electric vehicles shall include at least one complete UDDS performed entirely under a charge-sustaining mode of operation, The battery state-of-charge net change tolerance provisions specified in section ~~F~~G.10., of ~~the "California Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes"~~ the "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" and the "California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes" shall not apply.

* * * *

4.3. Subparagraph (c), amend subparagraph (c)(1) to include: A 2012 and later model-year off-vehicle charge capable hybrid electric vehicle that is tested either for exhaust emissions only or for refueling emissions, shall be processed in accordance with the provisions of ~~section F, of the "California Exhaust Emission~~

~~Standards and Test Procedures for 2009 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes,"~~ section G of the "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" or the "California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes" with the following exceptions.

* * * *

4.3.2. The battery state-of-charge net change tolerance provisions specified in ~~section F.10., of the "California Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes"~~ section G.10., of the "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" and the "California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes" shall not apply.

* * * *

4.4. Amend subparagraph (d) as follows: Canister purging: nonintegrated systems. For all vehicles, except for 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles equipped with non-integrated refueling canister-only systems, within one hour of completion of canister loading to breakthrough, the fuel tank(s) shall be further filled to 95 percent of nominal tank capacity determined to the nearest one-tenth of a U.S. gallon (0.38 liter) with the fuel specified in Sec. 86.113-94. During this fueling operation, the refueling emissions canister(s) shall be disconnected, unless the manufacturer specifies that the canister(s) should not be disconnected. Following completion of refueling, the refueling emissions canister(s) shall be reconnected, if the canister was disconnected during refueling. Special care shall be taken during this step to avoid damage to the components and the integrity of the fuel system. For all vehicles, including 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles equipped with non-integrated refueling canister-only systems, vehicle driving to purge the refueling canister(s) shall be performed using either the chassis dynamometer procedure or the test track procedure, as described in subparagraphs (d)(1) and (d)(2) of 40 CFR 86.153-98 [April 28, 2014]. The Executive Officer may choose to shorten the vehicle driving for a partial refueling test as described

in subparagraph (d)(3) of 40 CFR 86.153-98 [April 28, 2014]. For vehicles equipped with dual fuel tanks that can be individually selected or isolated, the required volume of fuel shall be driven out of one tank, the second tank shall be selected as the fuel source, and the required volume of fuel shall be driven out of the second tank. A manufacturer shall plan for interruptions in the vehicle drivedowns due to factors such as work schedules, driver relief, and test equipment considerations, using good engineering practice.

4.4.1. A 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicle shall be processed in accordance with the provisions of ~~section F of the "California Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes,"~~ section G of the "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" or the "California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," with the following exception.

* * * *

4.4.3. The battery state-of-charge net change tolerance provisions specified in section F.10., of the ~~"California Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes"~~ "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" and the "California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes" shall not apply.

* * * *

State of California
AIR RESOURCES BOARD

PROPOSED 15-DAY MODIFICATIONS

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:	October 21, 2014
Amended:	[Insert date of amendment]

Note: The following text contains staff's suggested modifications to these test procedures as originally proposed September 2, 2014. Unless otherwise indicated below, the text of the originally proposed amendments to this document are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions compared to the test procedures as last amended October 21, 2014. The modified language now proposed by staff is shown in double underline to indicate additions and ~~double strikeout~~ to indicate deletions. Staff is proposing modifications to limited portions of the original proposal; for some portions of the original proposal for which no modifications are proposed, the text has been omitted and the omission indicated by [No change] or "* * * *." [No change] also indicates proposed federal provisions that are also proposed for incorporation herein without change. Existing intervening text that is not amended is indicated by "* * * *".

Date of Release: December 23, 2014; Proposed 15-day Changes
Date of Hearing: October 23, 2014

* * * *

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2004 AND SUBSEQUENT MODEL HEAVY-DUTY OTTO-CYCLE ENGINES AND VEHICLES

* * * *

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

* * * *

25. **Maintenance.** [§86.xxx-25]

1. §86.004-25. ~~October 17, 1997~~ ~~April 28, 2014~~August 8, 2014. [No change.]

* * * *

Part II. OTHER REQUIREMENTS; TEST PROCEDURES

* * * *

Subpart H – Engine Fluids, Test Fuels, Analytical Gases and Other Calibration Standards.

* * * *

1065.710 Gasoline. ~~June 30, 2008~~ April 28, 2014.

* * * *

2. Delete subparagraph (b) and replace with the following:

(b)(1) **Certification Gasoline Fuel Specifications for the 2004 through 2019 Model Years**.

For 2004 through 2019 model engines certifying in accordance with these test procedures, gasoline having the specifications listed below may be used in exhaust and evaporative emission testing as an option to the specifications ~~referred to~~ in

§1065.710(c). If a manufacturer elects to utilize this option, both exhaust and evaporative emission testing shall be conducted by the manufacturer with gasoline having the specifications listed below, and the Executive Officer shall conduct exhaust and evaporative emission testing with gasoline having the specifications listed below. For the 2015 through 2019 model years, gasoline having the specifications listed in the following section (b)(2) or gasoline having the specifications in §1065.710(b), may be used in exhaust and evaporative emission testing as an option to the specifications ~~referred to~~ in §1065.710(c) and this section (b)(1). If a manufacturer elects to certify a 2015 through 2019 model year engine using gasoline having the specifications listed in the following section (b)(2) or gasoline having the specifications in §1065.710(b), both exhaust and evaporative emission testing shall be conducted by the manufacturer with gasoline having the specifications listed in the following section (b)(2) or gasoline having the specifications in §1065.710(b), respectively, and the Executive Officer shall conduct exhaust and evaporative emission testing with gasoline having the specifications listed in the following section (b)(2) or gasoline having the specifications in §1065.710(b), respectively.

* * * *

(b)(2) **Certification Gasoline Fuel Specifications for the 2020 and Subsequent Model Years**.

For 2020 and subsequent model engines, gasoline having the specifications listed below may be used in exhaust and evaporative emission testing as an option to the specifications in CFR §1065.710(b). If a manufacturer elects to utilize this option, ~~shall be used in~~ both exhaust and evaporative emission testing shall be conducted by the manufacturer with gasoline having the specifications listed below, and the Executive Officer shall conduct exhaust and evaporative emission testing with gasoline having the specifications listed below. If a manufacturer elects to utilize gasoline having the specifications in CFR §1065.710(b), both exhaust and evaporative emission testing shall be conducted by the manufacturer with gasoline having the specifications in CFR §1065.710(b), and the Executive Officer shall conduct exhaust and evaporative emission testing with gasoline having the specifications in CFR §1065.710(b).

* * * *

1065.725 High-level ethanol-gasoline blends. April 28, 2014.

* * * *

B. California provisions.

* * * *

2 **California Certification Fuel Specifications – Mixtures of Petroleum and Alcohol Fuels for Flexible Fuel Vehicles.**

2.1 **Exhaust emission test fuel for emission-data and durability-data vehicles.** For Otto-cycle or diesel alcohol vehicles and hybrid electric vehicles which use Otto-cycle or diesel alcohol engines, methanol or ethanol fuel used for exhaust emission testing shall meet the applicable specifications set forth in section 2292.2, title 13, CCR, (Specifications for M-85 Fuel Methanol) or section 2292.4 (Specifications for E-85 Fuel Ethanol) as modified by the following. E-85 that meets the specifications in §1065.725 may be used in exhaust and evaporative emission testing as an option to the E-85 Fuel Ethanol specifications in this subparagraph. If a manufacturer elects to utilize E-85 Fuel Ethanol having the specifications listed below, the Executive Officer shall conduct exhaust emission testing with E-85 Fuel Ethanol having the specifications listed below. If a manufacturer elects to utilize E-85 Fuel Ethanol having the specifications set forth in 40 CFR §1065.725, the Executive Officer shall conduct exhaust emission testing with E-85 Fuel Ethanol having the specifications set forth in 40 CFR §1065.725.

* * * *

Subpart N - ~~Emission Regulations for New Otto-Cycle and Diesel Heavy-Duty Engines; Gaseous and Particulate~~ Exhaust Test Procedures for Heavy-Duty Engines

* * * *

86.1305~~-2010~~ Introduction; structure of subpart. ~~September 15, 2011~~ ~~April 28, 2014~~August 8, 2014.

* * * *

State of California
AIR RESOURCES BOARD

PROPOSED 15-DAY MODIFICATIONS

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: October 21, 2014
Amended: [Insert date of amendment]

Note: The following text contains staff's suggested modifications to these test procedures as originally proposed September 2, 2014. Unless otherwise indicated below, the text of the originally proposed amendments to this document are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions compared to the test procedures as last amended October 21, 2014. The modified language now proposed by staff is shown in double underline to indicate additions and ~~double strikeout~~ to indicate deletions. Staff is proposing modifications to limited portions of the original proposal; for some portions of the original proposal for which no modifications are proposed, the text has been omitted and the omission indicated by [No change] or "* * * *." [No change] also indicates proposed federal provisions that are also proposed for incorporation herein without change. Existing intervening text that is not amended is indicated by "* * * *".

Date of Release: December 23, 2014; Proposed 15-day Changes
Date of Hearing: October 23, 2014

* * * *

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2004 AND SUBSEQUENT MODEL HEAVY-DUTY DIESEL ENGINES AND VEHICLES

* * * *

PART 86 – CONTROL OF EMISSIONS FROM NEW AND IN-USE HIGHWAY VEHICLES AND ENGINES

* * * *

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.

* * * *

25. Maintenance. [§86.xxx-25]

A. Federal provisions.

1. **§86.004-25**. ~~October 21, 1997~~~~April 28, 2014~~August 8, 2014.

* * * *

Subpart H – Engine Fluids, Test Fuels, Analytical Gases and Other Calibration Standards

1065.701 General requirements for test fuels. April 30, 2010.

* * * *

B. California provisions.

1. Methanol Fuel.

1.1 Exhaust emission test fuel. For diesel alcohol vehicles and hybrid electric vehicles which use diesel alcohol engines, methanol or ethanol fuel used for exhaust and evaporative emission testing shall meet the specifications set forth in title 13, CCR, section 2292.1 (Specifications for M-100 Fuel Methanol) or section 2292.3 (Specification for E-100 Fuel Ethanol) as modified by the following:

Specification	Limit
M-100 Fuel Methanol	
Methanol	98.0 ± 0.5 vol. percent
Ethanol	1.0 vol. Percent (max.)
Petroleum fuel meeting the specifications of 40 CFR §~~86.1313-98~~1065.703	1.0 ± 0.1 vol. percent
E-100 Fuel Ethanol	
Ethanol	98.0 ± 0.5 vol. percent
Methanol	1.0 vol. Percent (max.)
Petroleum fuel meeting the specifications of 40 CFR §~~86.1313-98~~1065.703	1.0 ± 0.1 vol. percent

* * * *

2. **Mixtures Of Petroleum and ~~Methanol~~ Alcohol Fuels for Flexible Fuel Vehicles.**

2.1 **Exhaust emission test fuel for emission-data and durability-data vehicles**. For diesel alcohol vehicles and hybrid electric vehicles which use diesel alcohol engines, methanol or ethanol fuel used for exhaust emission testing shall meet the applicable specifications set forth in title 13, CCR, section 2292.2 (Specifications for M-85 Fuel Methanol) or section 2292.4 (Specifications for E-85 Fuel Ethanol) as modified by the following:

Specification	Limit
M-85 Fuel Methanol	
Petroleum fuel meeting the specifications of 40 CFR §~~86.1313-98~~1065.703	13-16 vol. percent
Reid vapor pressure	8.0-8.5 psi, using common blending components from the gasoline stream.
E-85 Fuel Ethanol	
Petroleum fuel meeting the specifications of 40 CFR §~~86.1313-98~~1065.703	15-21 vol. percent
Reid vapor pressure	8.0-8.5 psi, using common blending components from the gasoline stream.

2.2 **Mileage accumulation fuel.** For flexible fuel diesel alcohol vehicles and hybrid electric vehicles that use diesel alcohol engines, petroleum fuel shall meet the applicable specifications in §86.1313-98(a) or (b), as modified by these test procedures, and methanol or ethanol fuel shall meet the applicable specifications set forth in title 13, CCR, section 2292.2 (Specifications for M-85 Fuel Methanol) or section 2292.4 (Specification for E-85 Fuel Ethanol). Mileage accumulation procedures shall be subject to the requirements set forth in §§ 86.00~~1~~4-26 and 86.1831-01(a) and (b) and are subject to the prior approval of the Executive Officer. A manufacturer shall consider expected customer fuel usage as well as emission deterioration when developing its durability demonstration.

* * * *

1065.725 High-level ethanol-gasoline blends. April 28, 2014.

* * * *

B. California provisions.

* * * *

2 **California Certification Fuel Specifications – Mixtures of Petroleum and Alcohol Fuels for Flexible Fuel Vehicles.**

2.1 **Exhaust emission test fuel for emission-data and durability-data vehicles.** For Otto-cycle or diesel alcohol vehicles and hybrid electric vehicles which use Otto-cycle or diesel alcohol engines, methanol or ethanol fuel used for exhaust emission testing shall meet the applicable specifications set forth in section 2292.2, title 13, CCR, (Specifications for M-85 Fuel Methanol) or section 2292.4 (Specifications for E-85 Fuel Ethanol) as modified by the following. E-85 that meets the specifications in §1065.725 may be used in exhaust and evaporative emission testing as an option to the E-85 Fuel Ethanol specifications in this subparagraph. If a manufacturer elects to utilize E-85 Fuel Ethanol having the specifications listed below, the Executive Officer shall conduct exhaust emission testing with E-85 Fuel Ethanol having the specifications listed below. If a manufacturer elects to utilize E-85 Fuel Ethanol having the specifications set forth in 40 CFR §1065.725, the Executive Officer shall conduct exhaust emission testing with E-85 Fuel Ethanol having the specifications set forth in 40 CFR §1065.725.

* * * *

Subpart N - ~~Emission Regulations for New Otto-Cycle and Diesel Heavy-Duty Engines; Gaseous and Particulate~~ Exhaust Test Procedures for Heavy-duty Engines

* * * *

86.1305~~-2010~~ Introduction; structure of subpart. ~~September 15, 2011~~ ~~April 28, 2014~~August 8, 2014.

* * * *

California Environmental Protection Agency
AIR RESOURCES BOARD

PROPOSED 15-DAY MODIFICATIONS

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2018 AND SUBSEQUENT MODEL ZERO-EMISSION VEHICLES AND HYBRID ELECTRIC VEHICLES, IN THE PASSENGER CAR, LIGHT-DUTY TRUCK AND MEDIUM-DUTY VEHICLE CLASSES

Adopted: March 22, 2012
Amended: December 6, 2012
Amended: May 30, 2014
Amended: [Insert Date of Amendment]

Note: The following text contains staff's suggested modifications to these test procedures as originally proposed September 2, 2014. Unless otherwise indicated below, the text of the originally proposed amendments to this document are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions compared to the test procedures as amended May 30, 2014. The modified language now proposed by staff is shown in double underline to indicate additions and ~~double strikeout~~ to indicate deletions. Staff is proposing modifications to limited portions of the original proposal; for some portions of the original proposal for which no modifications are proposed, the text has been omitted and the omission indicated by [No change] or "* * * *". [No change] also 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: December 23, 2014; Proposed 15-day Changes
Date of Hearing: October 23, 2014

* * * *

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2018 AND SUBSEQUENT MODEL ZERO-EMISSION VEHICLES AND HYBRID ELECTRIC VEHICLES, IN THE PASSENGER CAR, LIGHT-DUTY TRUCK AND MEDIUM-DUTY VEHICLE CLASSES

* * * *

B. Definitions and Terminology.

1. Definitions.

* * * *

"All-Electric Range ~~(AER)~~Test" or "AERT" means a test sequence used to determine the range of an electric vehicle or of a hybrid electric vehicle without the use of its auxiliary power unit. The vehicle shall be tested for all-electric range in default mode or in normal mode if the vehicle does not have a default mode. The Urban All-Electric Range Test ($AERT_u$) ~~cycle~~ determines the Urban All-Electric Range (AER_u) and ~~consists of~~ the Highway All-Electric Range ($AERT_h$) determines the Highway All-Electric Range (AER_h) ~~Fuel Economy Schedule and the Urban Dynamometer Driving Schedule~~ (see section ~~E~~G of these test procedures).

* * * *

"Charge-increasing operation" means a type of vehicle operation that occurs when the energy storage SOC may fluctuate but, on average, increases while the vehicle is driven over two or more consecutive UDDS cycles. To test PHEVs with charge-increasing operation, follow the test requirements for charge-sustaining operation in section G.5 with the modifications specific to charge-increasing operation. A charge-increasing driver-selectable mode ~~that activates a charge-increasing operation~~ is not included in this definition but is considered a mode and not an operation. ~~When testing the driver-selectable mode, the SOC shall be set at the lowest normal level allowed by the vehicle during UDDS driving as the initial SOC level for the test.~~

* * * *

"Default Mode" means the operating mode to which the vehicle automatically reverts after a vehicle is turned off and subsequently turned on. A vehicle with default mode would require the driver to select an alternative mode each time the vehicle is turned on if the driver prefers an alternative mode.

* * * *

"**Driver-Selectable Mode"** means an operating mode ~~of the engine~~ that the vehicle driver can manually engage by means of an instrument panel button, switch, screen menu, etc., anytime the vehicle is activated (e.g., when the key is in the on position).

* * * *

"Normal Mode" means the operating mode where the vehicle automatically optimizes engine, battery, transmission, and braking operation for the most common driving conditions as determined by the manufacturer. Normal mode would be equivalent to default mode if the vehicle has default mode.

* * * *

D. Certification Requirements.

* * * *

2. Information Requirements: Application for Certification. Except as noted below, the Part I (40 CFR §86.1843-01(c)) certification application shall include the following:

* * * *

2.15 For off-vehicle charge capable hybrid electric vehicles certifying to section ~~F~~G, the manufacturer shall provide the Urban All-Electric Range (AER_u), Urban Charge-Depleting Cycle Range (R_{cdcu}), the Urban Charge-Depleting Actual Range (R_{cdau}), the Urban Charge-Depleting to Charge-Sustaining ~~Urban~~ Range (R_{cdcsu}), the Highway All-Electric Range (AER_h), the Highway Charge-Depleting Cycle Range (R_{cdch}), the Highway Charge-Depleting Actual Range (**(**R_{cdah}), the Highway Charge-Depleting to Charge-Sustaining ~~Highway~~ Range (R_{cdcsh}), the Urban Equivalent All-Electric Range ($EAER_u$), the Highway Equivalent All-Electric Range ($EAER_h$), the Urban Electric Range Fraction (ERF_u), and the Highway Electric Range Fraction (ERF_h). In addition, the manufacturer shall provide the following:

* * * *

(d) end-of-test option(s) selected for the Urban Charge-Sustaining Emission Test and Urban Charge-Depleting Emission Test as described in section(s) G.5.3 and G.5.4.2, respectively;

* * * *

(f) end-of-test option selected for Highway ~~Charge-Sustaining~~ Emission Test as described in section G.6.1;

~~(f)~~(g) end-of-test option selected for US06 Test as described in section G.7.1;

~~(g)~~(h) end-of-test option selected for SC03 Test as described in section G.7.2.

* * * *

F. Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles (including Fuel Cell Vehicles and Hybrid Fuel Cell Vehicles) and All 2018 and Subsequent Model Hybrid-Electric Vehicles, Except Off-Vehicle Charge Capable Hybrid Electric Vehicles.

* * * *

Migration of the test procedures for measuring exhaust emissions from 40 CFR Part 86 to 40 CFR Part 1066 shall be done in accordance with Part II, Subpart A, section 100.1 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," ~~unless otherwise noted~~.

* * * *

6. Urban Emission Test Provisions for All Hybrid Electric Vehicles, Except Hybrid Fuel Cell Vehicles and Off-Vehicle Charge Capable Hybrid Electric Vehicles.

Alternative procedures may be used if shown to yield equivalent results and ~~if shown to yield equivalent results and~~ if approved in advance by the Executive Officer of the Air Resources Board.

For ~~the Urban Emission Test, Highway Emission Test, US06 Emission Test, and the SC03 Emission Test,~~ vehicles with more than one driver-selectable mode (e.g., normal mode, economy mode, performance mode, or any other operating mode available to the driver), emission testing must be done in the one driver-selectable mode that represents the worst case urban NMOG + NOx emissions of the engine over the Urban Emission Test set forth in this section F.6. For example, if a vehicle has two driver-selectable modes, the manufacturer shall determine worst case NMOG + NOx

emissions by comparing the emission results of the two driver-selectable modes. Compliance with applicable emission standards shall be based on worst case emission testing.

Confirmatory testing and/or in-use compliance testing may be performed in any driver-selectable mode ~~of the engine~~ to ensure compliance with emission standards.

6.1 Urban Test Applicability and General Provisions for All Hybrid Electric Vehicles, Except Hybrid Fuel Cell Vehicles and Off-Vehicle Charge Capable Hybrid Electric Vehicles.

* * * *

6.1.3 Amend subparagraph (c)(1)(i): The Urban Emission Test consists of an engine startup during the first UDDS cycle followed by a 10-minute key-off soak. The first engine startup (with all accessories turned off) that occurs during a UDDS cycle with vehicle shutdown at the end of the UDDS cycle makes a complete cold-start UDDS cycle. Following a 10-minute key-off soak, the subsequent UDDS cycle is a hot-start UDDS cycle. The UDDS cycle can be considered as a two phase cycle where the first 505 seconds of the UDDS cycle is the transient phase, and the remaining 867 seconds of the UDDS cycle is the stabilized phase.~~A single sample is collected for a full UDDS cycle (cold-start or hot-start).~~

* * * *

6.~~1~~2 Urban Vehicle Preconditioning for All Hybrid Electric Vehicles, Except Hybrid Fuel Cell Vehicles and Off-Vehicle Charge Capable Hybrid Electric Vehicles.

* * * *

6.~~1~~2.~~4~~3 Following the initial fuel drain and fill, the vehicle shall complete an initial soak period of a minimum of 6 hours. After completing the initial soak period, the vehicle shall be pushed or towed into position on a dynamometer and preconditioned by driving the UDDS cycle. ~~If the auxiliary power unit is capable of being manually activated, the auxiliary power unit shall be manually activated at the beginning of and operated throughout the preconditioning drive.~~

6.~~1~~2.~~5~~4 ~~Within five minutes of~~After completing the preconditioning drive, battery state-of-charge ~~shall~~ may be set by driving additional UDDS cycles such that the SOC Criterion is satisfied by applying the SOC Net Energy Change Tolerances

in section F.9. ~~The battery state-of-charge may be set by driving additional UDDS cycles.~~ at a level that satisfies one of the following conditions:

* * * *

6.2.5 A fuel drain and fill shall be performed pursuant to the provisions of the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles."

6.2.6 The vehicle shall be soaked for 12-36 hours. During this soak period, canister preconditioning shall be performed pursuant to the provisions of the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles." Battery SOC may be set during the soak period by discharging or charging the battery such that the SOC Criterion is satisfied when applying the SOC Net Energy Change Tolerances in section F.9.

6.3 Urban Dynamometer Test Run, Gaseous and Particulate Emissions for All Hybrid Electric Vehicles, Except Hybrid Fuel Cell Vehicles and Off-Vehicle Charge Capable Hybrid Electric Vehicles.

To be conducted pursuant to 40 CFR §1066.815 [April 28, 2014] ~~§86.137-96 [March 24, 1993]~~ with the following revisions:

6.3.1 Amend subparagraph (a): *General*. The Urban Emission Test consists of a cold-start ~~test~~UDDS cycle and hot-start ~~test~~UDDS cycle as described in section F.6.1.3.~~The dynamometer run shall consist of two tests, a "cold" start test, after a second fuel drain and fill and a 12 to 36 hour soak period performed pursuant to the provisions of the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles" and a "hot" start test following the cold start test by 10 minutes. The complete dynamometer test consists of a cold start drive of 7.5 miles (12.1 km) and a hot start drive of 7.5 miles (12.1 km). The vehicle shall be stored prior to the emission test in such a manner that precipitation (e.g., rain or dew) does not occur on the vehicle. The vehicle is allowed to stand on the dynamometer during the 10 minute time period between each test.~~

6.3.2 Amend subparagraph (b) ~~as follows.~~: *PM sampling options*. Collect PM using the procedures specified in subparagraphs (b)(1) or (b)(2) or (b)(5) of 40 CFR §1066.815 (subparagraphs (b)(3) ~~through~~and (b)~~(5)~~(4) are not applicable) and use the corresponding equation in section F.6.5 to calculate composite PM emissions. Testing must meet the requirements related to filter face velocity as described in 40 CFR §1065.170(c)(1)(vi), except as specified in paragraph (b)(5) of 40 CFR §1066.815. For procedures involving flow weighting, set the filter face

velocity to a weighting target of 1.0 to meet the requirements of 40 CFR §1065.170(c)(1)(vi). Allow filter face velocity to decrease as a percentage of the weighting factor if the weighting factor is less than 1.0. Use the appropriate equations in 40 CFR §1066.610 to show that you meet the dilution factor requirements of 40 CFR §1066.110(b)(2)(iii)(B).

6.3.3 Amend subparagraphs (b)(1): ~~You may collect a~~A separate PM sample for transient and ~~stablilized portions~~stabilized phases of the cold-start UDDS cycle and the hot-start UDDS cycle may be collected. This may be done by sampling with four ~~bags~~filters.

6.3.4 Subparagraph (b)(2). [No change.]

6.3.5 Delete subparagraphs (b)(3) ~~through~~and (b)~~(5)~~(4).

6.3.6 Subparagraphs ~~(c)~~(b)(5) through (c)(2). [No change.]

* * * *

6.3.10 Amend subparagraph (d)(1)(i): Precondition the vehicle as described in section F.6.2. Initiate the cold-start ~~test~~UDDS cycle in the driver-selectable mode to be tested for the Urban Emission Test following the 12 to 36 hour soak period.

6.3.11 Subparagraphs (d)(1)(ii) ~~through~~and (d)(1)(iii). [No change.]

* * * *

6.3.14 Amend subparagraph (2)(i): Initiate the hot-start ~~test~~UDDS cycle in the same driver-selectable mode as in section F.6.3.10 above (9 to 11) minutes after the end of the sample period for the cold-start UDDS cycle.

* * * *

6.3.18 **Additional End-of-Test Criterion.** If the SOC Net Energy Change Tolerance is not satisfied after the hot-start UDDS cycle in section F.6.3.17, then the alternative End-of-Test criterion pursuant to 40 CFR §1066.501 may be used to validate testing with the following revisions:

6.3.18.1 Delete subparagraphs (a)(1) through (a)(2)(i).

6.3.18.2 Amend subparagraph (a)(2)(ii): The alternative End-of-Test criterion of ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010) may be used to validate an Urban Emission Test with

approval from the Executive Officer if the ±1% SOC Net Energy Change Tolerances in section F.9 are insufficient to validate testing. If the alternative End-of-Test criteria of ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010) is used to validate testing, then confirmatory and in-use compliance testing shall also be validated based on the ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010).

6.3.18.3 Amend subparagraph (a)(2)(iii): Appendix C of SAE J1711 (June 2010) may be used to correct CO_2 emissions and carbon-related exhaust emissions, but may not be used to correct measured values for criteria pollutant emissions.

6.3.18.4 Delete subparagraphs (a)(2)(iv) through (c).

* * * *

6.4 Calculations – Urban Gaseous ~~Exhaust~~ Emissions for All Hybrid Electric Vehicles, Except Hybrid Fuel Cell Vehicles and Off-Vehicle Charge Capable Hybrid Electric Vehicles.

* * * *

6.4.2 Amend subparagraph (b): Calculate the final composite gaseous test results as a mass-weighted value, $e_{[\text{emission}]-\text{FTPcomp}}$, in grams per mile using the following equation:

$$e_{[\text{emission}]-\text{FTPcomp}} = 0.43\left(\frac{m_{\text{c}}}{D_{\text{c}}}\right) + 0.57\left(\frac{m_{\text{h}}}{D_{\text{h}}}\right)$$

Where:

m_c = the mass emissions determined from the cold-start UDDS cycle, in grams. If the cold-start UDDS cycle consists of ~~bag~~phase 1 ~~transition~~cold transient emissions and ~~bag~~phase 2 cold stabilized emissions, then sum ~~bag~~phase 1 and ~~bag~~phase 2 emissions to determine m_c.

D_c = the measured driving distance from the cold-start UDDS cycle, in miles. If the cold-start UDDS cycle consists of ~~bag~~phase 1 distance and ~~bag~~phase 2 distance, then sum ~~bag~~phase 1 and ~~bag~~phase 2 distances to determine D_c.

m_h = the mass emissions determined from the hot-start UDDS cycle, in grams. If the hot-start UDDS cycle consists of ~~bag~~phase ~~1~~3 ~~transition~~hot

transient emissions and ~~bag~~phase ~~2~~4 hot stabilized emissions, then sum ~~bag~~phase ~~1~~3 and ~~bag~~phase ~~2~~4 emissions to determine m_h.

D_h = the driving distance from the hot-start UDDS cycle, in grams. If the hot-start UDDS cycle consists of ~~bag~~phase ~~1~~3 distance and ~~bag~~phase ~~2~~4 distance, then sum ~~bag~~phase ~~1~~3 and ~~bag~~phase ~~2~~4 distances to determine D_h.

* * * *

6.5 Calculations – Urban Particulate Emissions for All Hybrid Electric Vehicles, Except Hybrid Fuel Cell Vehicles and Off-Vehicle Charge Capable Hybrid Electric Vehicles.

* * * *

6.5.2 Amend subparagraphs (c) through (c)(1): Calculate the final composite PM test results as a mass-weighted value, $e_{\mathrm{PM-FTPcomp}}$, in grams per mile as follows:

(1) Use the following equation for PM measured as described in §1066.815(b)(1) or (2):

$$e_{\mathrm{PM-FTPcomp}} = 0.43\left(\frac{m_{\mathrm{PM-cUDDS}}}{D_{\mathrm{c}}}\right) + 0.57\left(\frac{m_{\mathrm{PM-hUDDS}}}{D_{\mathrm{h}}}\right)$$

Where:

$m_{\mathrm{PM\text{-}cUDDS}}$ = the combined PM mass emissions determined from the cold-start UDDS ~~test interval~~cycle (~~bag~~phase 1 and ~~bag~~phase 2), in grams, as calculated using Eq. 1066.605-2.

D_c = the measured driving distance from the cold-start UDDS cycle, in miles. If the cold-start UDDS cycle consists of ~~bag~~phase 1 distance and ~~bag~~phase 2 distance, then sum ~~bag~~phase 1 and ~~bag~~phase 2 distances to determine D_c.

$m_{\mathrm{PM\text{-}hUDDS}}$ = the combined PM mass emissions determined from the hot-start UDDS ~~test interval~~cycle (~~bag~~phase 3 and ~~bag~~phase 4), in grams, as calculated using Eq. 1066.605-2. ~~This is the hot-stabilized portion from either the first or second UDS cycle (bag 2, unless you measure bag 4), in addition to the hot transient portion (bag 3).~~

D_h = the driving distance from the hot-start UDDS cycle, in grams. If the hot-start UDDS cycle consists of ~~bag~~phase ~~1~~3 distance and ~~bag~~phase ~~2~~4 distance, then sum ~~bag~~phase ~~1~~3 and ~~bag~~phase ~~2~~4 distances to determine D_h.

6.5.3 Subparagraph (c)(2). [Not applicable.]

6.5.4 Amend subparagraph (c)(3): Use the following equation for PM measured as described in §1066.815(b)(5):

$$e_{\mathrm{PM-FTPcomp}} = \frac{m_{\mathrm{PM}}}{0.43(D_{\mathrm{c}}) + 0.57(D_{\mathrm{h}})}$$

Where:
m_{PM} = the combined PM mass emissions determined from the cold-start UDDS cycle and the hot-start UDDS cycle (phase 1, phase 2, phase 3, and phase 4), in grams, as calculated using Eq. 1066.605-4.

D_c = the measured driving distance from the cold-start UDDS cycle, in miles. If the cold-start UDDS cycle consists of phase 1 distance and phase 2 distance, then sum phase 1 and phase 2 distances to determine D_c.

D_h = the driving distance from the hot-start UDDS cycle, in grams. If the hot-start UDDS cycle consists of phase 3 distance and phase 4 distance, then sum phase 3 and phase 4 distances to determine D_h.

* * * *

7. Highway Emission Test Provisions for All Hybrid Electric Vehicles, Except Hybrid Fuel Cell Vehicles and Off-Vehicle Charge Capable Hybrid Electric Vehicles.

* * * *

For vehicles with more than one driver-selectable mode (e.g., normal mode, economy mode, performance mode, or any other operating mode available to the driver), emission testing must be done in the one driver-selectable mode that represents the worst case highway NMOG + NOx emissions of the engine over the Highway Emission Test set forth in this section F.7. For example, if a vehicle has two driver-selectable modes, the manufacturer shall determine worst case NMOG + NOx

emissions by comparing the emission results of the two driver-selectable modes. Compliance with applicable emission standards shall be based on worst case emission testing.

7.1 Determination of Highway Emissions for All Hybrid Electric Vehicles, Except Hybrid Fuel Cell Vehicles and Off-Vehicle Charge Capable Hybrid Electric Vehicles.

To be conducted pursuant to 40 CFR §1066.840 [April 28, 2014] with the following revisions.

7.1.1 Amend subparagraph (a): Perform the Highway Emission Test immediately following the Urban Emission Test or a previous Highway Emission Test when this is practical. If the Highway Emission Test starts more than 3 hours after the Urban Emission Test (including evaporative emission measurements, if applicable) or a previous Highway Emission Test, operate the vehicle over one UDDS cycle to precondition the vehicle. If driver-selectable modes are available, activate the driver-selectable mode to be tested ~~shall be activated during~~ for the UDDS preconditioning drive. Additional preconditioning UDDS cycles may be approved in advance by the Executive Officer ~~in unusual circumstances~~ if the need for additional preconditioning is demonstrated by the manufacturer.

7.1.2 Amend subparagraph (b): Operate the vehicle over the HFEDS cycle for preconditioning. If driver-selectable modes are available, activate the driver-selectable mode to be tested for the preconditioning drive and for the following HFEDS cycle with emission sampling. Allow the vehicle to idle for 15 seconds (with the vehicle in gear), then start a repeat run of the HFEDS cycle and simultaneously start sampling and recording. A valid test shall satisfy the SOC Net Energy Change Tolerances in section F.9 for the HFEDS cycle with emission sampling.

* * * *

7.1.4 **Additional End-of-Test Criterion.** If the SOC Net Energy Change Tolerance is not satisfied for the HFEDS cycle with emission sampling in section F.7.1.3, then the alternative End-of-Test criterion pursuant to 40 CFR §1066.501 may be used with the following revisions:

7.1.4.1 Delete subparagraphs (a)(1) through (a)(2)(i).

7.1.4.2 Amend subparagraph (a)(2)(ii): The alternative End-of-Test criterion of ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010) may be used to validate a Highway Emission Test with approval from the Executive Officer if the ±1% SOC Net Energy Change

Tolerances in section F.9 are insufficient to validate testing. If the alternative End-of-Test criteria of ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010) is used to validate testing, then confirmatory and in-use compliance testing shall also be validated based on the ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010).

7.1.4.3 Amend subparagraph (a)(2)(iii): Appendix C of SAE J1711 (June 2010) may be used to correct CO_2 emissions~~,~~ and carbon-related exhaust emissions, but may not be used to correct measured values for criteria pollutant emissions.

7.1.4.4 Delete subparagraphs (a)(2)(iv) through (c).

8. SFTP Emission Test Provisions for All Hybrid Electric Vehicles, Except Hybrid Fuel Cell Vehicles and Off-Vehicle Charge Capable Hybrid Electric Vehicles.

Alternative procedures may be used if approved in advance by the Executive Officer of the Air Resources Board.

For vehicles with more than one driver-selectable mode (e.g., normal mode, economy mode, performance mode, or any other operating mode available to the driver), emission testing must be done in the one driver-selectable mode that represents the worst case SFTP NMOG + NOx emissions of the engine over the SFTP Emission Test set forth in this section F.8. For example, if a vehicle has two driver-selectable modes, the manufacturer shall determine worst case NMOG + NOx emissions by comparing the emission results of the two driver-selectable modes. Compliance with applicable emission standards shall be based on worst case emission testing.

To be conducted pursuant to 40 CFR §1066.801, except a noted.

* * * *

8.~~2~~1 US06 Emission Test.

To be conducted pursuant to 40 CFR §1066.831 [April 28, 2014]~~§86.159-08 [December 27, 2006]~~ with the following revisions.

8.1.1 Subparagraphs (a) through ~~(b)(iii)(2)~~ (b)(1). [No change.]

8.1.2 Amend subparagraph ~~(b)(3): If available, the driver-selectable mode to be tested shall be activated during the preconditioning drive. Warm-up~~

~~the vehicle to a stabilized condition as follows:~~ (b)(1)(i): For aggressive-driving tests that do not follow the Urban Emission Test or the Highway Emission Test.

8.1.3 Amend ~~S~~subparagraph~~s (b)(3)(i) through (e)(2)(iii). [No change.]~~ (b)(1)(ii): For a test element that starts more than 72 hours after the most recent Urban Emission Test or Highway Emission Test (with or without evaporative emission measurements).

8.1.4 Amend subparagraph ~~(e)(3): A valid test shall satisfy the SOC Net Energy Change Tolerances in section F.9 for the US06 cycle with emission sampling. Turn the vehicle off 2 seconds after the end of the last deceleration. Five seconds after the vehicle stops running, stop all sampling and recording, including background sampling. Stop any integrating deveices and indicate the end of the test cycle in the recorded data. Note that the 5 second delay is intended to account for sampling system transport.~~(b)(1)(iii): For testing in which the test vehicle has not remained in an area where ambient temperatures were within the range specified for testing since the previous Urban Emission Test or Highway Emission Test.

8.1.5 Subparagraph~~s (e)(4)~~ (b)(2) through (b)(3)(i). [No change.]

8.1.6 Amend subparagraph(b)(3)(ii): Operate the vehicle one time over one of the driving schedules specified in this paragraph (b)(3)(ii). A particular preconditioning driving schedule that is related to fuel effects on adaptive memory systems may be requested. If driver-selectable modes are available, activate the driver-selectable mode to be tested for the preconditioning drive and for the following US06 cycle with emission sampling. Sampling equipment may be exercised, but emissions measured during preconditioning may not be used to determine compliance with applicable emission standards. Choose from the following driving schedules:

8.1.7 Subparagraphs (b)(3)(ii)(A) through (b)(3)(ii)(B). [No change.]

8.1.8 Amend subparagraph (b)(3)(ii)(C): The HFEDS cycle.

8.1.9 Subparagraphs (b)(3)(ii)(D) through (e)(2)(iii): [No change.]

8.1.10 Amend subparagraph (e)(3): Turn the vehicle off 2 seconds after the end of the last deceleration. Five seconds after the vehicle stops running, stop all sampling and recording, including background sampling. Stop any integrating devices and indicate the end of the test cycle in the recorded data. Note that the 5 second delay is intended to account for sampling system

transport. A valid test shall satisfy the SOC Net Energy Change Tolerances in section F.9 for the US06 cycle with emission sampling.

8.1.11 Subparagraph (e)(4). [No change.]

8.1.12 **Additional End-of-Test Criterion.** If the SOC Net Energy Change Tolerance is not satisfied for the US06 cycle with emission sampling in section F.8.1.10, then the alternative End-of-Test criterion pursuant to 40 CFR §1066.501 may be used to validate testing with the following revisions:

8.1.12.1 Delete subparagraphs (a)(1) through (a)(2)(i).

8.1.12.2 Amend subparagraph (a)(2)(ii): The alternative End-of-Test criterion of ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010) may be used to validate a US06 Emission Test with approval from the Executive Officer if the ±1% SOC Net Energy Change Tolerances in section F.9 are insufficient to validate testing. If the alternative End-of-Test criteria of ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010) is used to validate testing, then confirmatory and in-use compliance testing shall also be validated based on the ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010).

8.1.12.3 Amend subparagraph (a)(2)(iii): Appendix C of SAE J1711 (June 2010) may be used to correct CO_2 emissions and carbon-related exhaust emissions, but may not be used to correct measured values for criteria pollutant emissions.

8.1.12.4 Delete subparagraphs (a)(2)(iv) through (c).

* * * *

~~8.4~~8.2 SC03 Emission Test.

To be conducted pursuant to 40 CFR §1066.835 [April 28, 2014] ~~§86.160-00 [December 8, 2005]~~ with the following revisions.

8.2.1 Subparagraphs (a) through (c)(4). [No change.]

8.2.2 Amend subparagraph (c)(5): Perform a preconditioning drive by operating the test vehicle over the first 505 seconds of the UDDS cycle (~~bag~~phase 1), the last 867 seconds of the UDDS cycle (~~bag~~phase 2), or the SC03 driving schedule. If driver-selectable modes are available, activate the driver-selectable mode to be tested ~~shall be activated during~~for the

preconditioning drive and for the following SC03 cycle with emission sampling. If the air conditioning test sequence starts more than 2 hours after a different exhaust emission test, the vehicle may be driven over one full UDDS cycle for the preconditioning drive instead of over one of the cycles listed previously in this section (c)(5).

* * * *

8.2.5 Subparagraphs (d)(3) through (f)(3)(iv). [No change.]

8.2.6 **Additional End-of-Test Criterion.** If the SOC Net Energy Change Tolerance is not satisfied for the SC03 cycle with emission sampling in section F.8.2.4, then the alternative End-of-Test criterion pursuant to 40 CFR §1066.501 may be used to validate testing with the following revisions:

8.2.6.1 Delete subparagraphs (a)(1) through (a)(2)(i).

8.2.6.2 Amend subparagraph (a)(2)(ii): The alternative End-of-Test criterion of ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010) may be used to validate an SC03 Emission Test with approval from the Executive Officer if the ±1% SOC Net Energy Change Tolerances in section F.9 are insufficient to validate testing. If the alternative End-of-Test criteria of ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010) is used to validate testing, then confirmatory and in-use compliance testing shall also be validated based on the ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010).

8.2.6.3 Amend subparagraph (a)(2)(iii): Appendix C of SAE J1711 (June 2010) may be used to correct CO_2 emissions and carbon-related exhaust emissions, but may not be used to correct measured values for criteria pollutant emissions.

8.2.6.4 Delete subparagraphs (a)(2)(iv) through (c).

* * * *

10. 50°F and 20°F Test Provision for All Hybrid Electric Vehicles, Except Hybrid Fuel Cell Vehicles and Off-Vehicle Capable Hybrid Electric Vehicles.

50°F testing shall be conducted pursuant to section F.6 with the modifications in Part II, Section D 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" and the additional following revisions.

20°F testing shall be conducted pursuant to section F.6 with the modifications in Part II Section B or Part II Section C, as applicable, 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" and the additional following revisions.

10.1 To satisfy test requirements for the 50°F emission test, the vehicle shall be emission tested in driver-selectable mode (if available) that represents the worst case urban ~~(~~NMOG + NOx~~)~~ emissions as determined in section F.6. To satisfy test requirements for the 20°F emission test, the vehicle shall be emission tested in the driver-selectable mode (if available) that represents the worst case ~~(~~CO~~)~~ emissions of the urban emission test following the procedure outlined in section F.6. For the 20°F and 50°F emission tests, the vehicle is not required to meet SOC net energy change tolerances.

10.2 One of the following two emission test options must be performed.

(i) A three phase test that includes phase one as the first 505 seconds of the cold-start UDDS cycle, phase two as the remaining 867 seconds ~~506 seconds to the end~~ of the cold-start UDDS cycle, a 10 minute key-off soak period, and phase three as the first 505 seconds of the hot-start UDDS cycle. Emission weighting is as follows:

$$Y_{wm} = 0.43 * \left(\frac{Y_1 + Y_2}{D_1 + D_2} \right) + 0.57 * \left(\frac{Y_2 + Y_3}{D_2 + D_3} \right)$$

Where:

Y_{wm} = Weighted mass emissions of each pollutant, i.e., THC, CO, THCE, NMOG, NMHCE, CH_4, NO_x, or CO_2, in grams per vehicle mile.

Y_1 = Mass emissions as calculated from phase one of the three phase test.

Y_2 = Mass emissions as calculated from phase two of the three phase test.

Y_3 = Mass emissions as calculated from phase three of the three phase test.

D_1 = The measured driving distance from phase one of the three phase tests, in miles.

D_2 = The measured driving distance from phase two of the three phase tests, in miles.

D_3 = The measured driving distance from phase three of the three phase tests, in miles.

(ii) A two phase test that includes phase one as a UDDS cycle, a 10 minute key-off soak period, and phase two as a UDDS cycle. Emission weighting for the four phase test will follow the procedure outlined in section F.6.4.

G. Test Procedures for 2018 and Subsequent Model Off-Vehicle Charge Capable Hybrid Electric Vehicles.

The "as adopted or amended dates" of the 40 CFR Part 86 regulations and the 40 CFR Part 1066 regulations referenced by this document are the dates identified in the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures ~~for 2001~~ and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," unless otherwise noted.

Migration of the test procedures for measuring exhaust emissions from 40 CFR Part 86 to 40 CFR Part 1066 shall be done in accordance with Part II, Subpart A, section 100.1 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.," ~~unless otherwise noted.~~

* * * *

5. Urban Emission Test Provisions for Off-Vehicle Charge Capable Hybrid Electric Vehicles.

Alternative procedures may be used ~~if shown to yield equivalent results and~~ if shown to yield equivalent results and if approved in advance by the Executive Officer of the Air Resources Board.

For the purpose of determining Urban All-Electric Range and Urban Equivalent All-Electric Range, the vehicle shall be range tested in default mode or in normal mode if the vehicle does not have a default mode.

For t~~T~~he purpose of demonstrating compliance with exhaust emission standards, ~~criteria~~ a vehicle must be emission tested in the vehicle operation (i.e., either charge-depleting, charge-sustaining, or charge-increasing operation) that represents

~~certification emissions for the Urban test shall be~~ the worst case ~~emissions of NMOG, CO, NOx, and PM from either the charge depleting or charge sustaining tests. The sum of~~ urban NMOG + NOx emissions of the engine ~~shall constitute the worst case for the urban charge sustaining or charge depleting modes of operation~~.

Vehicles with more than one driver-selectable mode ~~of operation of the auxiliary power unit~~ (e.g., normal mode, economy mode, performance mode, battery charging mode, ~~etc.~~or any other operating mode available to the driver) for a given charge-depleting, ~~or~~ charge-sustaining, or charge-increasing ~~test cycle~~operation must be emission tested in the one driver-selectable mode~~(s)~~ and vehicle operation (i.e., charge-depleting, charge-sustaining, charge-increasing) which represents the worst case urban NMOG + NOx emissions of the ~~auxiliary power unit~~ engine. For example, if a vehicle has two driver-selectable modes ~~and~~that can be tested in charge-depleting, charge-sustaining, and charge-increasing operations, the manufacturer shall determine worst case urban emissions of NMOG + NOx by comparing the following (1) mode 1 charge-depleting emissions, (2) mode 2 charge-depleting emissions, (3) mode 1 charge-sustaining emissions, (4) mode 2 charge-sustaining emissions, (5) mode 1 charge-increasing emissions, and (6) mode 2 charge-increasing emissions based on the Urban Charge-Depleting Emission Test and Urban Charge-Sustaining Emission Test. The exception to this would be for vehicles qualifying for the Alternative Urban Charge-Depleting Emission Test where the one driver-selectable mode representing the worst case urban NMOG + NOx emissions would be tested only on the Alternative Urban Charge-Depleting Emission Test. In addition, some driver-selectable modes are incompatible with testing of certain vehicle operations. For example, a charge-increasing driver-selectable mode is not compatible with a charge-depleting test.

In lieu of demonstrating the worst case urban NMOG + NOx emissions by certification testing in every urban charge-depleting driver-selectable mode, every urban charge-sustaining driver-selectable mode, and every charge-increasing driver-selectable mode ~~of operation~~, a manufacturer may determine the worst case operating mode by using non-certification emission data and/or an engineering evaluation. The manufacturer must report the data and/or engineering evaluation used to determine the worst case operating mode. The manufacturer must demonstrate compliance with all applicable emission standards using test data for the worst case operating mode.

For vehicles that qualify for and are tested on the Alternative Urban Charge-Depleting Emission Test in ~~sub~~section G.5.4.5, the urban worst case NMOG + NOx emissions may be determined for the Alternative Urban Charge-Depleting Emission Test alone. Therefore, a vehicle qualifying for the Alternative Urban Charge-Depleting Emission Test would not be required to ~~evaluate the urban worst case NMOG + NOx emissions~~ be emission tested in ~~for~~ charge-depleting, charge-sustaining, charge-increasing operations. If driver-selectable modes are available, each driver-selectable

mode must still be considered for worst case NMOG + NOx emissions for the Alternative Urban Charge-Depleting Emission Test.

Confirmatory testing and/or in-use compliance testing may ~~also~~ be performed in any driver-selectable mode ~~of operation the engine~~ in charge-depleting, charge-sustaining, or charge-increasing operation to ensure compliance with emission standards. For vehicles that qualify for and are certified on the Alternative Urban Charge-Depleting Emission Test, confirmatory testing and/or in-use compliance testing may be performed in any driver-selectable mode solely using the Alternative Urban Charge-Depleting Emission Test to ensure compliance with emission standards.

5.1 Urban Test Applicability and General Provisions for Off-Vehicle Charge Capable Hybrid Electric Vehicles.

To be conducted pursuant to 40 CFR §1066.801 [April 28, 2014] with the following revisions.

* * * *

5.1.3 Amend subparagraph (c)(1)(i): The Urban Charge-Sustaining Emission Test consists of an engine startup during the first UDDS cycle followed by a 10-minute key-off soak. The Urban Charge-Depleting Emission Test consists of a series of charge-depleting UDDS cycles each followed by a 10-minute key-off soak until charge-sustaining operation is achieved. The Urban Charge-Depleting Emission Test begins with the vehicle at full state-of-charge with engine startup occurring during the driving of the series of charge-depleting UDDS cycles. The first engine startup (with all accessories turned off) that occurs during a UDDS cycle followed by a vehicle shutdown at the end of the UDDS cycle makes a complete cold-start UDDS cycle. After a 10-minute key-off soak, the subsequent UDDS cycle is a hot-start UDDS cycle. The UDDS cycle can be considered as a two phase cycle where the first 505 seconds of the UDDS cycle is the transient phase, and the remaining 867 seconds of the UDDS cycle is the stabilized phase. For the Urban Charge-Depleting Emission Test, additional hot-start UDDS cycles each followed by a 10-minute key-off soak may be needed to achieve charge-sustaining operation.

* * * *

5.~~1~~2 Urban Vehicle Preconditioning for Off-Vehicle Charge Capable Hybrid Electric Vehicles.

To be conducted pursuant to the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles" with the following supplemental requirements:

5.~~1~~2.1 The vehicle shall be preconditioned ~~in the driver-selectable mode to be tested and~~ in charge-sustaining operation. If driver-selectable modes are available, activate the driver-selectable mode to be tested for the preconditioning drive with the vehicle initially in charge-sustaining operation at the start of the UDDS cycle. If, however, the vehicle is to be tested in charge-increasing operation (this does not apply to a driver-selectable charge-increasing mode), then the initial SOC for the preconditioning drive shall be set at the lowest normal SOC level allowed by the vehicle when driving on the UDDS cycle.~~For vehicles that do not allow manual activation of the auxiliary power unit, battery state-of-charge shall be set at a level that causes the vehicle to operate the auxiliary power unit for the maximum possible cumulative amount of time during the preconditioning drive.~~

* * * *

5.~~1~~2.~~3~~2 ~~After setting battery state-of-charge, t~~The vehicle shall be pushed or towed to a work area for the initial fuel drain and fill according to section III.D.1.~~4~~.4 of the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles."

* * * *

5.~~1~~2.~~7~~5 For the charge-depleting ~~range~~ emission test~~,~~ and the charge-sustaining emission test, the preconditioning cycle shall be the UDDS cycle and performed at this time. For the Urban Charge-Sustaining Emission Test, initial SOC may be set by driving additional UDDS cycles such that the SOC Criterion is satisfied when applying the SOC Net Energy Change Tolerances in section G.10. ~~The vehicle must be in charge-sustaining operation during the preconditioning drive. To determine charge sustaining operation, the vehicle must meet the SOC criterion in section G.10 from the start to the end of the two consecutive UDDSs. As an option, charge sustaining operation can be achieved for a single UDDS if data is provided showing that charge sustaining operation can consistently be maintained over one UDDS. The vehicle must meet the SOC criterion in section G.10 from the start to the end of a single UDDS. Alternative procedures may be used to determine charge sustain operation for the~~

~~precondition drive if the alternate procedure demonstrates charge sustaining operation based on section G.10 and is approved in advance by the Executive Officer of the Air Resources Board.~~

* * * *

5.~~1~~2.~~10~~8 For the ~~u~~Urban ~~c~~Charge-~~d~~Depleting ~~range~~ Emission ~~t~~Test, ~~the Alternative Urban Charge-Depleting Emission Test, the~~ ~~h~~Highway ~~c~~Charge-~~d~~Depleting ~~r~~Range ~~t~~Test, and the optional ~~c~~Cold ~~s~~Start US06 ~~r~~Range ~~t~~Test, charge the vehicle to full state-of-charge as specified by the vehicle manufacturer. For the Urban Charge-Sustaining Emission Test, initial SOC may be set during the soak period by discharging or charging the vehicle such that the SOC Criterion is satisfied when applying the SOC Net Energy Change Tolerances in section G.10. For the Alternative Urban Charge-Depleting Emission Test, only the initial dynamometer run to determine urban all-electric range as described in G.5.4.2 (ii) would require the vehicle to be charged to full state-of-charge prior to testing. For any subsequent dynamometer run to determine urban charge-depleting emissions for the Alternative Urban Charge-Depleting Emission Test, the initial SOC would be set according to G.5.4.2 (iv). The vehicle must be turned off during charging and charge time shall not exceed soak time.

* * * *

5.3 Determination of Urban Charge-Sustaining Emissions – ~~Urban~~ Dynamometer Test Run, Gaseous and Particulate Emissions for Off-Vehicle Charge Capable Hybrid Electric Vehicles.

To be conducted pursuant to 40 CFR §1066.815 [April 28, 2014] ~~§86.137-96 [March 24, 1993]~~ with the following revisions:

5.3.1 Amend subparagraph (a): *General*. The Urban Charge-Sustaining Emission Test consists of a cold-start ~~test~~UDDS cycle and hot-start ~~test~~UDDS cycle as described in section G.5.1.3. If driver-selectable modes are available, activate the driver-selectable mode to be tested for the Urban Charge-Sustaining Emission Test. ~~The dynamometer run shall consist of a series of UDDSs, after a second fuel drain and fill and a 12 to 36 hour soak period performed pursuant to the provisions of the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles." The vehicle shall be stored prior to the emission test in such a manner that precipitation (e.g., rain or dew) does not occur on the vehicle. The vehicle is allowed to stand on the dynamometer during the 10 minute time period between each UDDS.~~

5.3.2 Amend subparagraph (b) ~~as follows.~~: *PM sampling options*. Collect PM using the procedures specified in subparagraphs (b)(1) or (b)(2) or (b)(5) of 40 CFR §1066.815 (subparagraphs (b)(3) ~~through~~and (b)~~(5)~~(4) are not applicable) and use the corresponding equation in section G.5.6 to calculate ~~charge-sustaining~~ composite PM emissions. Testing must meet the requirements related to filter face velocity as described in 40 CFR §1065.170(c)(1)(vi), except as specified in paragraph (b)(5) of 40 CFR §1066.815. For procedures involving flow weighting, set the filter face velocity to a weighting target of 1.0 to meet the requirements of 40 CFR §1065.170(c)(1)(vi). Allow filter face velocity to decrease as a percentage of the weighting factor if the weighting factor is less than 1.0. Use the appropriate equations in 40 CFR §1066.610 to show that you meet the dilution factor requirements of 40 CFR §1066.110(b)(2)(iii)(B).

5.3.3 Amend subparagraphs (b)(1): ~~You may collect a~~A separate PM sample for transient and ~~stablilized portions~~stabilized phases of the cold-start UDDS cycle and the hot-start UDDS cycle may be collected. This may be done by sampling with four ~~bags~~filters.

* * * *

5.3.5 Delete subparagraphs (b)(3) ~~through~~and (b)~~(5)~~(4).

5.3.6 Subparagraphs ~~(c)~~(b)(5) through (c)(2). [No change.]

* * * *

5.3.10 Amend subparagraph (d)(1)(i): Precondition the vehicle as described in section G.5.2. Initiate the ~~charge-sustaining~~ cold-start ~~test~~Urban Charge-Sustaining Emission Test following the 12 to 36 hour soak period.

5.3.11 Subparagraphs (d)(1)(ii) ~~through~~and (d)(1)(iii). [No change.]

* * * *

5.3.14 Amend subparagraph (2)(i): Initiate the hot-start ~~test~~UDDS cycle (9 to 11) minutes after the end of the sample period for the cold-start UDDS cycle.

* * * *

5.3.17 Amend subparagraph (3): A valid test shall satisfy the SOC Net Energy Change Tolerances in section G.10. An option is allowed for PHEVs with charge-increasing operation or when testing PHEVs in a charge-increasing driver-selectable mode where a test may be considered valid if the SOC at the end

of the hot-start ~~test~~UDDS cycle is higher than the SOC at the beginning of the cold-start ~~test~~UDDS cycle. If this option is used, then confirmatory and in-use compliance tests shall also be considered valid if the SOC at the end of the hot-start ~~test~~UDDS cycle is higher than the SOC at the beginning of the cold-start ~~test~~UDDS cycle.

5.3.18 **Additional End-of-Test Criterion.** If the SOC Net Energy Change Tolerance is not satisfied after the hot-start UDDS cycle in section G.5.3.17, then the alternative End-of-Test criterion pursuant to 40 CFR §1066.501 may be used to validate testing with the following revisions:

5.3.18.1 Delete subparagraphs (a)(1) through (a)(2)(i).

5.3.18.2 Amend subparagraph (a)(2)(ii): The alternative End-of-Test criterion of ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010) may be used to validate an Urban Charge-Sustaining Emission Test with approval from the Executive Officer if the ±1% SOC Net Energy Change Tolerances in section G.10 are insufficient to validate testing. If the alternative End-of-Test criteria of ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010) is used to validate testing, then confirmatory and in-use compliance testing shall also be validated based on the ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010).

5.3.18.3 Amend subparagraph (a)(2)(iii): Appendix C of SAE J1711 (June 2010) may be used to correct CO_2 emissions and carbon-related exhaust emissions, but may not be used to correct measured values for criteria pollutant emissions.

5.3.18.4 Delete subparagraphs (a)(2)(iv) through (c).

* * * *

5.4 Determination of Urban All-Electric Range, ~~and~~ Urban Equivalent All-Electric Range, and Urban Charge-Depleting Emissions for Off-Vehicle Charge Capable Hybrid Electric Vehicles.

5.4.1 The **Urban All-Electric Range** shall be ~~shall be~~ defined as the distance that the vehicle is driven from the start of Urban Charge-Depleting ~~Range~~Emission Test until the ~~internal combustion~~ engine first starts in accordance with ~~subparagraph~~ section G.5.4.2.1. The Urban Charge-Depleting Emission Test is performed with the vehicle initially at full state-of-charge. When emission testing a vehicle in a driver-selectable mode other than default mode or normal mode, the distance of the Urban All-Electric Range, which occurs during the first portion of the

Urban Charge-Depleting Emission Test, shall not be considered as certification urban all-electric range for the purposes of compliance with the requirements in section C.

* * * *

5.4.2 **Urban Charge-Depleting ~~Range~~ Emission Test.**

* * * *

5.4.2.1 Amend subparagraph (a): *General*. The Urban Charge-Depleting Emission Test consists of the Urban All-Electric Range Test, a cold-start ~~test~~UDDS cycle when the engine starts followed by a 10-minute key off soak and ~~a~~ hot-start ~~test~~UDDS cycle(s) as described in section G.5.1.3. The Continuous Urban Test Schedule is used for the Urban Charge-Depleting Emission Test. If driver-selectable modes are available that can be appropriately tested with charge-depleting operation, then test the appropriate driver-selectable mode(s) as required for the Urban Charge-Depleting Emission Test. The Alternative Continuous Urban Test Schedule may be substituted for the Continuous Urban Test Schedule if the test facility is unable to perform the Continuous Urban Test Schedule. Refer to sections G.5.5, G.5.6, and G.11, for calculations of urban exhaust emissions, urban particulate emissions, and equivalent all-electric range, respectively. Emissions are measured for all test cycles when the auxiliary power unit is operating. For each test cycle for which emissions were not measured, the manufacturer must validate that the auxiliary power unit did not turn on at any time during the test cycle. If the engine starts operating toward the end of the cold-start UDDS cycle that may cause a less than hot engine start for the subsequent hot-start UDDS cycle, an additional hot-start UDDS cycle may be performed following the first hot-start UDDS cycle and be included in the hot-start mass summations Σm_{h} in the equation of section 5.5.1.2 and $\Sigma m_{PM\text{-}hUDDS}$ of the equation in section 5.6.1.2(1) along with the associated distance summations ΣD_{h}.

5.4.2.2 Amend subparagraph (b): *PM sampling options*. Collect PM using the procedures specified in subparagraphs (b)(1) or (b)(2) or (b)(5) of 40 CFR §1066.815 (subparagraphs (b)(3) ~~through~~and (b)~~(5)~~(4) are not applicable) and use the corresponding equation in section G.5.6 to calculate ~~charge-depleting~~ composite PM emissions. Testing must meet the requirements related to filter face velocity as described in 40 CFR §1065.170(c)(1)(vi), except as specified in paragraph (b)(5) of 40 CFR §1066.815. For procedures involving flow weighting, set the filter face velocity to a weighting target of 1.0 to meet the requirements of 40 CFR §1065.170(c)(1)(vi). Allow filter face velocity to decrease as a percentage of the weighting factor if the weighting factor is less

than 1.0. Use the appropriate equations in 40 CFR §1066.610 to show that you meet the dilution factor requirements of 40 CFR §1066.110(b)(2)(iii)(B).

5.4.2.3 Amend subparagraphs (b)(1): ~~You may collect a~~A separate PM sample for transient and ~~stablilized portions~~stabilized phases of the cold-start UDDS cycle and the hot-start UDDS cycle may be collected. This may be done by sampling with four ~~bags~~filters.

5.4.2.4 Subparagraph (b)(2). [No change.]

5.4.2.5 Delete subparagraphs (b)(3) ~~through~~and (b)~~(5)~~(4).

5.4.2.6 Subparagraphs ~~(c)~~(b)(5) through (c)(2). [No change.]

* * * *

5.4.2.10 Amend subparagraph (d)(1)(i): Precondition the vehicle as described in section G.5.2. Initiate the ~~charge-sustaining~~ cold-start ~~test~~Urban Charge-Depleting Emission Test following the 12 to 36 hour soak period.

5.4.2.11 Subparagraphs (d)(1)(ii) ~~through~~and (d)(1)(iii). [No change.]

* * * *

5.4.2.14 Amend subparagraph (2)(i): Initiate the hot-start ~~test~~UDDS cycle (9 to 11) minutes after the end of the sample period for the cold-start UDDS cycle.

* * * *

5.4.2.17 Amend subparagraph (3): A valid test shall satisfy the SOC Net Energy Change Tolerances in section G.10. ~~An option is allowed for PHEVs with charge-increasing operation where a test may be considered valid if the SOC at the end of the hot-start test is higher than the SOC at the beginning of the cold-start test. If this option is used, then confirmatory and in-use compliance tests shall also be considered valid if the SOC at the end of the hot-start test is higher than the SOC at the beginning of the cold-start test.~~

5.4.3 **Additional End-of-Test Criteria.** If the SOC Net Energy Change Tolerance is not satisfied after the hot-start ~~test~~UDDS cycle in section G.5.4.2.17, then the alternative End-of-Test criteria~~on~~ pursuant to 40 CFR §1066.501 may be used to validate testing with the following revisions:

* * * *

5.4.3.2 Amend subparagraph (a)(2)(ii): ~~The use of the End-of-Test criterion in Section 3.9 of SAE J1711 (June 2010) may be used.~~ The alternative End-of-Test criteria~~on~~ in Section 3.9~~.1~~ of SAE J1711 (June 2010) ~~and the Net Energy Change correction in Appendix C of SAE J1711 (June 2010)~~ may be used to validate an Urban Charge-Depleting Emission Test ~~with approval from the Executive Officer~~ if the SOC Net Energy Change Tolerances in section G.10 ~~specified criterion and correction~~ are insufficient to validate testing. ~~or inappropriate for establishing the transition between charge-depleting and charge-sustaining operation.~~ If the alternative End-of-Test criteria in Section 3.9 of SAE J1711 (June 2010) is used to validate testing, then confirmatory and in-use compliance testing shall also be validated based on Section 3.9 of SAE J1711 (June 2010).

~~5.4.3.3 Amend subparagraph (a)(2)(iii): Appendix C of SAE J1711 (June 2010) may be used to correct CO_2 emissions, and carbon-related exhaust emissions, but may not be used to correct measured values for criteria pollutant emissions.~~

5.4.3.~~4~~3 Delete subparagraphs (a)(2)~~(iv)~~(iii) through (c).

* * * *

5.4.5 **Alternative Urban Charge-Depleting Emission Test.**

A vehicle with an Urban All-Electric Range that is equal to or greater than four UDDS cycles and has an AER/EAER ratio that is equal to or greater than 0.98 may demonstrate compliance with applicable exhaust emission standards using this section G.5.4.5 in lieu of sections G.5.3 or G.5.4.2. The AER and EAER values used to calculate the AER/EAER ratio must each contain three significant figures after the decimal point. Rounding the calculated AER/EAER ratio up to 0.98 is prohibited. Use of the Alternative Urban Charge-Depleting Emission Test must be approved in advance by the Executive Officer.

For the purpose of measuring vehicle emissions, subparagraphs 5.4.5(i) and (ii) must be performed during the initial Alternative Urban Charge-Depleting Emission Test to determine urban all-electric range; these ~~subparagraphs~~subsections may be omitted during any subsequent Alternative Urban Charge-Depleting Emission Tests.

(i) The vehicle shall be charged to full state-of-charge.

(ii) **Dynamometer run to determine Urban All-Electric Range.**

The vehicle shall be placed or pushed onto a chassis dynamometer and operated through the Continuous Urban Test Schedule or the Alternative Continuous Urban Test Schedule with the vehicle in default mode or in normal mode if the vehicle does not have default mode. When the engine first starts, record SOC, and ~~stop testing~~continue driving until charge-sustaining operation is achieved. As an option, emissions may be measured so the full Urban Charge-Depleting Emission Test as described in section G.5.4.2 may be ~~performed~~used to determine ~~the SOC when the engine first starts~~ urban charge-depleting emissions for vehicles operating in default or normal mode. If this option is used, vehicle preconditioning according to section G.5.2 must be performed prior to this section G.5.4.5(ii). To determine the Urban Equivalent All-Electric Range for the TZEV Allowance in section C.3.3(a), the full Urban Charge-Depleting Emission Test option shall be performed and the Urban Equivalent All-Electric Range calculated in accordance with section G.11.

(iii) **Vehicle preconditioning.** The vehicle shall be preconditioned according to section G.5.2.

(iv) **Dynamometer run to determine Urban Charge-Depleting Emissions.** After the cold soak period, using the engine start SOC data from the previous section G.5.4.5(ii), set the SOC so that the engine starts at or before the first 45 seconds of the cold-start UDDS cycle. The SOC shall not be set below the normal operating SOC threshold of the vehicle as observed during the UDDS cycle. The engine must start at or before the first 45 seconds of the cold-start UDDS cycle to be valid. When testing the vehicle with any driver-selectable, charge-increasing mode activated, the initial SOC must be set so the vehicle is in charge-sustaining operation at the start of ~~at the lowest SOC within the normal operating SOC threshold of the vehicle as observed during~~ the cold-start UDDS cycle.

(v) The vehicle shall be placed or pushed onto a dynamometer and operated through a cold-start UDDS cycle followed by a 10 minute key-off soak and then a hot-start UDDS cycle. At the completion of the hot-start UDDS cycle, the test is completed. For ~~specific~~ additional testing ~~requirements~~information, ~~see~~ the testing parameters for the Urban Charge-Sustaining Emission Test in section G.5.3 are applicable. However, the Alternative Urban Charge-Depleting Emission Test does not require satisfying the SOC Net Energy Change Tolerance to be a valid test.

(vi) Refer to sections G.5.5 and G.5.6, for calculating urban gaseous emissions and urban particulate emissions, respectively.

(vii) **Optional ~~V~~vehicle charging after testing.** Vehicle may be fully charged following the Urban All-Electric Range Test in section G.5.4.5(ii). If this option is performed, ~~V~~vehicle charging shall begin within three hours after completing the ~~charge-depleting emission test~~Urban All-Electric Range Test in section G.5.4.5(ii), and the vehicle shall be charged to the manufacturer specified full state-of-charge. During charging, all applicable requirements in section G.3 must be met, and energy consumption shall be calculated pursuant to the requirements in section G.11.7.

* * * *

5.5 Calculations – Urban Gaseous ~~Exhaust~~ Emissions for Off-Vehicle Charge Capable Hybrid Electric Vehicles.

5.5.1 Urban Charge-Depleting Gaseous Emissions Calculations.

To be conducted pursuant to 40 CFR §1066.820 [April 28, 2014] with the following revisions:

5.5.1.1 Subparagraph (a). [No change.]

5.5.1.2 Amend subparagraph (b): Calculate the final composite gaseous test results as a mass-weighted value, $e_{[\text{emission}]-\text{FTPcomp}}$, in grams per mile using the following equation:

$$e_{[\text{emission}]-\text{FTPcomp}} = 0.43\left(\frac{m_{\text{c}}}{D_{\text{c}}}\right) + 0.57\left(\frac{\Sigma m_{\text{h}}}{\Sigma D_{\text{h}}}\right)$$

Where:

m_{c} = the mass emissions determined from the cold-start UDDS ~~test interval~~cycle, in grams. If the cold-start UDDS cycle consists of ~~bag~~phase 1 ~~transition~~cold transient emissions and ~~bag~~phase 2 cold stabilized emissions, then sum ~~bag~~phase 1 and ~~bag~~phase 2 emissions to determine m_{c}.

D_{c} = the measured driving distance from the cold-start UDDS ~~test interval~~cycle, in miles. If the cold-start UDDS cycle consists of ~~bag~~phase 1 distance and ~~bag~~phase 2 distance, then sum ~~bag~~phase 1 and ~~bag~~phase 2 distances to determine D_{c}.

Σm_{h} = the summation of the mass emissions determined from each hot-start UDDS cycle, in grams. If ~~the~~a hot-start UDDS cycle consists of

~~bag~~phase ~~1~~3 ~~transition~~hot transient emissions and ~~bag~~phase ~~2~~4 hot stabilized emissions, then sum ~~bag~~phase ~~1~~3 and ~~bag~~phase ~~2~~4 emissions to determine m_h for the each hot-start UDDS cycle.

ΣD_h = the summation of the driving distances from ~~the~~ each hot-start UDDS cycle, in miles. If ~~the~~a hot-start UDDS cycle consists of ~~bag~~phase ~~1~~3 distance and ~~bag~~phase ~~2~~4 distance, then sum ~~bag~~phase ~~1~~3 and ~~bag~~phase ~~2~~4 distances to determine D_h for each hot-start UDDS cycle.

~~n = hot-start UDDS cycle~~

* * * *

5.5.2 Urban Charge-Sustaining Gaseous Emissions Calculations.

* * * *

5.5.2.2 Amend subparagraph (b): Calculate the final composite gaseous test results as a mass-weighted value, $e_{[\text{emission}]-\text{FTPcomp}}$, in grams per mile using the following equation:

$$e_{[\text{emission}]-\text{FTPcomp}} = 0.43\left(\frac{m_c}{D_c}\right) + 0.57\left(\frac{m_h}{D_h}\right)$$

Where:

m_c = the mass emissions determined from the cold-start UDDS cycle, in grams. If the cold-start UDDS cycle consists of ~~bag~~phase 1 ~~transition~~cold transient emissions and ~~bag~~phase 2 cold stabilized emissions, then sum ~~bag~~phase 1 and ~~bag~~phase 2 emissions to determine m_c.

D_c = the measured driving distance from the cold-start UDDS cycle, in miles. If the cold-start UDDS cycle consists of ~~bag~~phase 1 distance and ~~bag~~phase 2 distance, then sum ~~bag~~phase 1 and ~~bag~~phase 2 distances to determine D_c.

m_h = the mass emissions determined from the hot-start UDDS cycle, in grams. If the hot-start UDDS cycle consists of ~~bag~~phase ~~1~~3 ~~transition~~hot transient emissions and ~~bag~~phase ~~2~~4 hot stabilized

emissions, then sum ~~bag~~phase ~~1~~3 and ~~bag~~phase ~~2~~4 emissions to determine m_{h}.

D_{h} = the driving distance from the hot-start UDDS cycle, in grams. If the hot-start UDDS cycle consists of ~~bag~~phase ~~1~~3 distance and ~~bag~~phase ~~2~~4 distance, then sum ~~bag~~phase ~~1~~3 and ~~bag~~phase ~~2~~4 distances to determine D_{h}.

5.5.2.3 Subparagraph~~s~~ (c). [Not applicable.]

* * * *

5.6 Calculations – Urban Particulate Emissions for Off-Vehicle Charge Capable Hybrid Electric Vehicles.

5.6.1 Urban Charge-Depleting Particulate Emissions Calculations.

To be conducted pursuant to 40 CFR §1066.820 [April 28, 2014] with the following revisions~~:~~.

* * * *

5.6.1.2 Amend subparagraphs (c) through (c)(1): Calculate the final composite PM test results as a mass-weighted value, $e_{\mathrm{PM-FTPcomp}}$, in grams per mile as follows:

(1) Use the following equation for PM measured as described in §1066.815(b)(1) or (2):

$$e_{\mathrm{PM-FTPcomp}} = 0.43\left(\frac{m_{\mathrm{PM-cUDDS}}}{D_{\mathrm{c}}}\right) + 0.57\left(\frac{\Sigma m_{\mathrm{PM-hUDDS}}}{\Sigma D_{\mathrm{h}}}\right)$$

Where:

$m_{\mathrm{PM\text{-}cUDDS}}$ = ~~the PM mass emissions determined from the cold-start UDDS cycle, in grams, as calculated using 40 CFR §1066.605 [April 28, 2014], Eq. 1066.605-2. If the cold-start UDDS cycle consists of bag 1 transition PM emissions and bag 2 stabilized PM emissions, then sum bag 1 and bag 2 emissions to determine~~ m_{e}~~,~~ the combined PM mass emissions determined from the cold-start UDDS cycle (phase 1 and phase 2), in grams, as calculated using Eq. 1066.605-2.

Date of Release: December 23, 2014; Proposed 15-day Changes
Date of Hearing: October 23, 2014

D_c = the measured driving distance from the cold-start UDDS cycle, in miles. If the cold-start UDDS cycle consists of ~~bag~~phase 1 distance and ~~bag~~phase 2 distance, then sum ~~bag~~phase 1 and ~~bag~~phase 2 distances to determine D_c.

$\Sigma m_{PM\text{-}hUDDS}$ = the summation of the PM mass emissions determined from each hot-start UDDS cycle, in grams, as calculated using ~~40 CFR §1066.605 [April 28, 2014],~~ Eq. 1066.605-2. If ~~the~~a hot-start UDDS cycle consists of ~~bag~~phase ~~1~~3 ~~transition~~hot transient emissions and ~~bag~~phase ~~2~~4 hot stabilized emissions, then sum ~~bag~~phase ~~1~~3 and ~~bag~~phase ~~2~~4 emissions to determine ~~m_n~~$m_{PM\text{-}hUDDS}$ for the each hot-start UDDS cycle.

ΣD_h = the summation of the driving distances from each hot-start UDDS cycle, in miles. If ~~the~~a hot-start UDDS cycle consists of ~~bag~~phase ~~1~~3 distance and ~~bag~~phase ~~2~~4 distance, then sum ~~bag~~phase ~~1~~3 and ~~bag~~phase ~~2~~4 distances to determine D_h for each hot-start UDDS cycle.

~~*n* = hot-start UDDS cycle~~

5.6.1.3 Subparagraph (c)(2). [Not applicable.]

5.6.1.4 Amend subparagraph (c)(3): Use the following equation for PM measured as described in §1066.815(b)(5):

$$e_{PM-FTPcomp} = \frac{m_{PM}}{0.43(D_c) + 0.57(D_h)}$$

Where:

m_{PM} = the combined PM mass emissions determined from the cold-start UDDS cycle and the hot-start UDDS cycle (phase 1, phase 2, phase 3, and phase 4), in grams, as calculated using Eq. 1066.605-4.

D_c = the measured driving distance from the cold-start UDDS cycle, in miles. If the cold-start UDDS cycle consists of phase 1 distance and phase 2 distance, then sum phase 1 and phase 2 distances to determine D_c.

D_h = the driving distance from the hot-start UDDS cycle, in grams. If the hot-start UDDS cycle consists of phase 3 distance and phase 4 distance, then sum phase 3 and phase 4 distances to determine D_h.

5.6.2 Urban Charge-Sustaining Particulate Emissions Calculations.

To be conducted pursuant to 40 CFR §1066.820 [April 28, 2014] with the following revisions.

5.6.2.1 Subparagraphs (a) to (b). [Not applicable.]

5.6.2.~~1~~2 Amend subparagraphs (c) through (c)(1): Calculate the final composite PM test results as a mass-weighted value, $e_{\mathrm{PM-FTPcomp}}$, in grams per mile as follows:

(1) Use the following equation for PM measured as described in §1066.815(b)(1) or (2):

$$e_{\mathrm{PM-FTPcomp}} = 0.43\left(\frac{m_{\mathrm{PM-cUDDS}}}{D_c}\right) + 0.57\left(\frac{m_{\mathrm{PM-hUDDS}}}{D_h}\right)$$

Where:

$m_{\mathrm{PM\text{-}cUDDS}}$ = the combined PM mass emissions determined from the cold-start UDDS ~~test interval~~cycle (~~bag~~phase 1 and ~~bag~~phase2), in grams, as calculated using Eq. 1066.605-2.

D_c = the measured driving distance from the cold-start UDDS cycle, in miles. If the cold-start UDDS cycle consists of ~~bag~~phase 1 distance and ~~bag~~phase 2 distance, then sum ~~bag~~phase 1 and ~~bag~~phase 2 distances to determine D_c.

$m_{\mathrm{PM\text{-}hUDDS}}$ = the combined PM mass emissions determined from the hot-start UDDS ~~test interval~~cycle (~~bag~~phase 3 and ~~bag~~phase 4), in grams, as calculated using Eq. 1066.605-2. ~~This is the hot-stabilized portion from either the first or second UDS (bag 2, unless you measure bag 4), in addition to the hot transient portion (bag 3).~~

D_h = the driving distance from the hot-start UDDS cycle, in grams. If the hot-start UDDS cycle consists of ~~bag~~phase ~~1~~3 distance and ~~bag~~phase ~~2~~4 distance, then sum ~~bag~~phase ~~1~~3 and ~~bag~~phase ~~2~~4 distances to determine D_h.

5.6.2.3 Subparagraph (c)(2). [Not applicable.]

5.6.2.4 Amend subparagraph (c)(3): Use the following equation for PM measured as described in §1066.815(b)(5):

$$e_{\mathrm{PM-FTPcomp}} = \frac{m_{\mathrm{PM}}}{0.43(D_c) + 0.57(D_h)}$$

Where:

m_{PM} = the combined PM mass emissions determined from the cold-start UDDS cycle and the hot-start UDDS cycle (phase 1, phase 2, phase 3, and phase 4), in grams, as calculated using Eq. 1066.605-4.

D_c = the measured driving distance from the cold-start UDDS cycle, in miles. If the cold-start UDDS cycle consists of phase 1 distance and phase 2 distance, then sum phase 1 and phase 2 distances to determine D_c.

D_h = the driving distance from the hot-start UDDS cycle, in grams. If the hot-start UDDS cycle consists of phase 3 distance and phase 4 distance, then sum phase 3 and phase 4 distances to determine D_h.

* * * *

6. Highway Emission Test Provisions for Off-Vehicle Charge Capable Hybrid Electric Vehicles.

To be conducted pursuant to 40 CFR §1066.801 [April 28, 2104], except as noted.

Alternative procedures may be used if approved in advance by the Executive Officer of the Air Resources Board.

For the purpose of determining Highway All-Electric Range and Highway Equivalent All-Electric Range, the vehicle shall be range tested in default mode or in normal mode if the vehicle does not have a default mode.

For the purpose of demonstrating compliance with exhaust emission standards, a vehicle must be emission tested in the vehicle operation (i.e., either ~~charge-depleting,~~ charge-sustaining~~,~~ or charge-increasing operation) that represents the worst case highway NMOG + NOx emissions of the engine.

Vehicles with more than one driver-selectable mode ~~of operation of the auxiliary power unit~~ (e.g., normal mode, economy mode, performance mode, battery charging mode, ~~etc.~~or any other operating mode available to the driver) for a given ~~charge depleting, or~~ charge-sustaining~~,~~ or charge-increasing ~~test cycle~~operation (if available) must be emission tested in the one driver-selectable mode~~(s)~~ and vehicle operation (i.e., ~~charge-depleting,~~ charge-sustaining, charge-increasing) which represents the worst case ~~urban~~highway NMOG + NOx emissions of the ~~auxiliary power unit~~ engine. For example, if a vehicle has two driver-selectable modes ~~and charge-depleting,~~ that can be tested in charge-sustaining~~,~~ and charge-increasing operations, the manufacturer shall determine worst case ~~urban~~highway emissions of NMOG + NOx by comparing the following (1) mode 1 ~~charge-depleting emissions, (2) mode 2 charge-depleting emissions, (3) mode 1~~ charge-sustaining emissions, ~~(4)~~(2) mode 2 charge-sustaining emissions, ~~(5)~~(3) mode 1 charge-increasing emissions, and ~~(6)~~(4) mode 2 charge-increasing emissions based on the Highway ~~Charge-Sustaining~~ Emission Test.

In lieu of demonstrating the worst case ~~urban~~highway NMOG + NOx emissions by certification testing in ~~every highway charge-depleting driver-selectable mode,~~ every highway charge-sustaining driver-selectable mode~~,~~ and every highway charge-increasing (if available) driver-selectable mode ~~of operation~~, a manufacturer may determine the worst case operating mode by using non-certification emission data and/or an engineering evaluation. The manufacturer must report the data and/or engineering evaluation used to determine the worst case operating mode. The manufacturer must demonstrate compliance with all applicable emission standards using test data for the worst case operating mode.

Confirmatory testing and/or in-use compliance testing may ~~also~~ be performed in any driver-selectable mode ~~of operation the engine~~ in ~~charge-depleting,~~ charge-sustaining~~,~~ or charge-increasing operation (if available) to ensure compliance with emission standards.

* * * *

6.~~3~~1 Determination of Highway All-Electric Range~~, and~~, Highway Equivalent All-Electric Range, and Highway Emissions for Off-Vehicle Charge Capable Hybrid Electric Vehicles.

* * * *

6.~~3.3~~1.4 **Highway ~~Charge Sustaining~~ Emission Test.** ~~The Highway Charge-Sustaining Emission Test is conducted cold, and after charge-sustaining operation has been reached, or an optional charge-sustaining test mode has been activated, and no subsequent charge has been performed:~~.

To be conducted pursuant to 40 CFR §1066.840 [April 28, 2014] with the following revisions.

6.1.4.1 Amend subparagraph (a): Perform the Highway ~~Charge-Sustaining~~ Emission Test immediately following any of the urban emission tests, the Highway Charge-Depleting Range Test, or a previous Highway ~~Charge-Sustaining~~ Emission Test when this is practical. If the Highway ~~Charge-Sustaining~~ Emission Test starts more than 3 hours after any of the urban emission tests (including evaporative emission measurements, if applicable), Highway Charge-Depleting Range Test, or a previous Highway ~~Charge-Sustaining~~ Emission Test, operate the vehicle over one UDDS cycle in charge-sustaining operation to precondition the vehicle. If driver-selectable modes are available, activate the driver-selectable mode to be tested ~~shall be activated during~~ for the UDDS preconditioning drive with the vehicle initially in charge-sustaining operation. Additional preconditioning UDDS cycles may be approved in advance by Executive Officer ~~in unusual circumstances~~ if the need for additional preconditioning is demonstrated by the manufacturer.

6.1.4.2 Amend subparagraph (b): Operate the vehicle over the HFEDS cycle in charge-sustaining operation for preconditioning. If driver-selectable modes are available, do not activate the driver-selectable mode to be tested for the preconditioning drive, but set the vehicle in default mode or normal mode for the preconditioning drive with the vehicle in charge-sustaining operation. If, however, the vehicle is to be tested in charge-increasing operation (this does not apply to a driver-selectable charge-increasing mode), then the initial SOC shall be set at the lowest normal SOC level allowed by the vehicle when driving on the UDDS cycle. After the preconditioning drive, ~~A~~allow the vehicle to idle for 15 seconds (with the vehicle in gear), then start a repeat run of the HFEDS cycle and simultaneously start sampling and recording. If a driver-selectable mode is to be tested after the preconditioning drive, ~~A~~allow the vehicle to idle for 15

seconds (with the vehicle in gear), activate the driver-selectable mode to be tested, then start a repeat run of the HFEDS cycle and simultaneously start sampling and recording. A valid test shall satisfy the SOC Net Energy Change Tolerances in section ~~F.9~~G.10 for the HFEDS cycle with emission sampling. An option is allowed for PHEVs with charge-increasing operation or when testing PHEVs in a charge-increasing driver-selectable mode where a test may be considered valid if the SOC at the end of the HFEDS cycle with emission sampling is higher than the SOC at the beginning of the same HFEDS cycle with emission sampling. If this option is used, then confirmatory and in-use compliance tests shall also be considered valid if the SOC at the end of the HFEDS cycle with emission sampling is higher than the SOC at the beginning of the same HFEDS cycle with emission sampling.

* * * *

6.1.5 **Additional End-of-Test Criterion.** If the SOC Net Energy Change Tolerance is not satisfied ~~after the hot start test~~for the HFEDS cycle with emission sampling in section ~~G.6.4.1.2~~G.6.1.4.2, then the alternative End-of-Test criterion pursuant to 40 CFR §1066.501 may be used with the following revisions:

* * * *

6.1.5.2 Amend subparagraph (a)(2)(ii): ~~The use of the End-of-Test criterion in Section 3.9 of SAE J1711 (June 2010) may be used.~~ The alternative End-of-Test criterion ~~in Section 3.9.1 of SAE J1711 (June 2010) and the Net Energy Change correction~~ of ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010) may be used to validate a Highway Emission Test with approval from the Executive Officer if the ±1% SOC Net Energy Change Tolerances in section G.10 are insufficient to validate testing.~~specified criterion and correction are insufficient or inappropriate for establishing the transition between charge-depleting and charge-sustaining operation.~~ If the alternative End-of-Test criteria of ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010) is used to validate testing, then confirmatory and in-use compliance testing shall also be validated based on the ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010).

6.1.5.3 Amend subparagraph (a)(2)(iii): Appendix C of SAE J1711 (June 2010) may be used to correct CO_2 emissions~~,~~ and carbon-related exhaust emissions, but may not be used to correct measured values for criteria pollutant emissions.

* * * *

7. SFTP Emission Test Provisions for Off-Vehicle Charge Capable Hybrid Electric Vehicles.

To be conducted pursuant to 40 CFR §1066.801, except as noted.

Alternative procedures may be used if approved in advance by the Executive Officer of the Air Resources Board.

For the purpose of determining US06 all electric range capability as required in section C.3.3(a)(1), a vehicle shall be range tested in default mode or in normal mode if the vehicle does not have a default mode in accordance with section G.7.3.

For the purpose of demonstrating compliance with exhaust emission standards, a vehicle must be emission tested in the vehicle operation (i.e., either charge-sustaining or charge-increasing operation) that represents the worst case SFTP NMOG + NOx emissions of the engine.

Vehicles with more than one driver-selectable mode ~~of operation of the auxiliary power unit~~ (e.g., normal mode, economy mode, performance mode, battery charging mode, ~~etc.~~or any other operating mode available to the driver) for a given ~~charge depleting, or~~ charge-sustaining, or charge-increasing ~~test cycle~~ operation (if available) must be emission tested in the one driver-selectable mode~~(s)~~ and vehicle operation (i.e., ~~charge-depleting,~~ charge-sustaining, charge-increasing) which represents the worst case ~~urban~~SFTP NMOG + NOx emissions of the ~~auxiliary power unit~~ engine. For example, if a vehicle has two driver-selectable modes ~~and charge-depleting,~~ that can be tested in charge-sustaining~~,~~ and charge-increasing operations, the manufacturer shall determine worst case ~~urban~~SFTP emissions of NMOG + NOx by comparing the following (1) mode 1 ~~charge-depleting emissions, (2) mode 2 charge-depleting emissions, (3) mode 1~~ charge-sustaining emissions, ~~(4)~~(2) mode 2 charge-sustaining emissions, ~~(5)~~(3) mode 1 charge-increasing emissions, and ~~(6)~~(4) mode 2 charge-increasing emissions based on the US06 Emission Test and SC03 Emission Test.

In lieu of demonstrating the worst case ~~urban~~SFTP NMOG + NOx emissions by certification testing in ~~every SFTP charge-depleting driver-selectable mode,~~ every SFTP charge-sustaining driver-selectable mode~~,~~ and every SFTP charge-increasing (if available) driver-selectable mode ~~of operation~~, a manufacturer may determine the worst case operating mode by using non-certification emission data and/or an engineering evaluation. The manufacturer must report the data and/or engineering evaluation used to determine the worst case operating mode. The manufacturer must demonstrate compliance with all applicable emission standards using test data for the worst case operating mode.

Confirmatory testing and/or in-use compliance testing may ~~also~~ be performed in any driver-selectable mode ~~of operation the engine~~ in ~~charge-depleting,~~ charge-sustaining~~,~~ or charge-increasing operation to ensure compliance with emission standards.

* * * *

7.~~2~~1 US06 Emission Test.

To be conducted pursuant to 40 CFR §1066.831 [April 28, 2014] ~~§86.159-08 [December 27, 2006]~~ with the following revisions. ~~This section G.7.1 7.2 shall apply during charge-sustaining operation or at an optional charge sustaining test mode that has been activated, if no subsequent charge has been performed~~.

7.1.1 Subparagraphs (a) through ~~(b)(iii)(2)~~ (b)(1). [No change.]

7.1.2 Amend subparagraph ~~(b)(3): If available, the driver-selectable mode to be tested shall be activated during the preconditioning drive. Warm up the vehicle to a stabilized condition as follows:~~ (b)(1)(i): For aggressive-driving tests that do not follow any urban emission test or the Highway Emission Test.

7.1.3 Amend ~~S~~subparagraph~~s (b)(3)(i) through (e)(2)(iii). [No change.]~~ (b)(1)(ii): For a test element that starts more than 72 hours after any most recent urban emission test or the Highway Emission Test (with or without evaporative emission measurements).

7.1.4 Amend subparagraph ~~(e)(3): Turn the vehicle off 2 seconds after the end of the last deceleration. Five seconds after the vehicle stops running, stop all sampling and recording, including background sampling. Stop any integrating deveices and indicate the end of the test cycle in the recorded data. Note that the 5 second delay is intended to account for sampling system transport. A valid test shall satisfy the SOC Net Energy Change Tolerances in section G.10 for the US06 cycle with emission sampling. An option is allowed for PHEVs with charge-increasing operation where a test may be considered valid if the SOC at the end of the US06 cycle with emissions sampling is higher than the SOC at the beginning of the same US06 cycle with emissions sampling. If this option is used, then confirmatory and in-use compliance tests shall also be considered valid if the SOC at the end of the US06 cycle with emissions sampling is higher than the SOC at the beginning of the same US06 cycle with emissions sampling.~~(b)(1)(iii): For testing in which the test vehicle has not remained in an area where ambient temperatures were within the range specified for testing since any previous urban emission test or the Highway Emission Test.

7.1.5 Subparagraphs ~~(e)(4)~~ (b)(2) through (b)(3)(i). [No change.]

7.1.6 Amend subparagraph(b)(3)(ii): Operate the vehicle one time over one of the driving schedules specified in this paragraph (b)(3)(ii). A particular preconditioning driving schedule that is related to fuel effects on adaptive memory systems may be requested. The vehicle shall be in charge-sustaining operation for this preconditioning drive. If driver-selectable modes are available, do not activate the driver-selectable mode to be tested for the preconditioning drive, but set the vehicle in default mode or normal mode for the preconditioning drive with the vehicle in charge-sustaining operation. If, however, the vehicle is to be tested in charge-increasing operation (this does not apply to a driver-selectable charge-increasing mode), then the initial SOC shall be set at the lowest normal SOC level allowed by the vehicle when driving on the UDDS cycle. Sampling equipment may be exercised, but emissions may not be determined during preconditioning. Choose from the following driving schedules:

7.1.7 Subparagraphs (b)(3)(ii)(A) through (b)(3)(ii)(B). [No change.]

7.1.8 Amend subparagraph (b)(3)(ii)(C): The HFEDS cycle.

7.1.9 Subparagraphs (b)(3)(ii)(D) through (e). [No change.]

7.1.10 Amend subparagraph (e)(1): Following the preconditioning specified in paragraph (b) of this section, place the vehicle in gear and simultaneously start sampling and recording. If a driver-selectable mode is to be tested following the preconditioning, activate the driver-selectable mode, place the vehicle in gear, and simultaneously start sampling and recording. Begin the first acceleration 5 seconds after placing the vehicle in gear.

7.1.11 Subparagraphs (e)(2) through (e)(2)(iii). [No change.]

7.1.12 Amend subparagraph (e)(3): Turn the vehicle off 2 seconds after the end of the last deceleration. Five seconds after the vehicle stops running, stop all sampling and recording, including background sampling. Stop any integrating devices and indicate the end of the test cycle in the recorded data. Note that the 5 second delay is intended to account for sampling system transport. A valid test shall satisfy the SOC Net Energy Change Tolerances in section G.10 for the US06 cycle with emission sampling. An option is allowed for PHEVs with charge-increasing operation or when testing PHEVs in a charge-increasing driver-selectable mode where a test may be considered valid if the SOC at the end of the US06 cycle with emission sampling is higher than the SOC at the beginning of the same US06 cycle with emission sampling. If this option is used, then confirmatory and in-use compliance tests shall also be considered valid if the SOC at the end of the US06

cycle with emission sampling is higher than the SOC at the beginning of the same US06 cycle with emission sampling.

7.1.13 Subparagraph (e)(4). [No change.]

7.1.14 **Additional End-of-Test Criterion.** If the SOC Net Energy Change Tolerance is not satisfied for the US06 cycle with emission sampling in section G.7.1.10, then the alternative End-of-Test criterion pursuant to 40 CFR §1066.501 may be used to validate testing with the following revisions:

7.1.14.1 Delete subparagraphs (a)(1) through (a)(2)(i).

7.1.14.2 Amend subparagraph (a)(2)(ii): The alternative End-of-Test criterion of ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010) may be used to validate a US06 Emission Test with approval from the Executive Officer if the ±1% SOC Net Energy Change Tolerances in section G.10 are insufficient to validate testing. If the alternative End-of-Test criteria of ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010) is used to validate testing, then confirmatory and in-use compliance testing shall also be validated based on the ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010).

7.1.14.3 Amend subparagraph (a)(2)(iii): Appendix C of SAE J1711 (June 2010) may be used to correct CO_2 emissions and carbon-related exhaust emissions, but may not be used to correct measured values for criteria pollutant emissions.

7.1.14.4 Delete subparagraphs (a)(2)(iv) through (c).

* * * *

~~7.4~~7.2 SC03 Emission Test.

To be conducted pursuant to 40 CFR §1066.835 [April 28, 2014] ~~§86.160-00 [December 8, 2005]~~ with the following revisions. ~~This section G.7.2 7.4 shall apply during charge-sustaining operation or at an optional charge sustaining test mode that has been activated, if no subsequent charge has been performed. The vehicle shall be preconditioned in the driver-selected operating mode in which it will be tested and at a charge-sustaining SOC level.~~References to ~~§86.162-03 shall mean §86.162-03 as adopted October 22, 1996.~~

7.2.1 Subparagraphs (a) through (c)(4). [No change.]

7.2.2 Amend subparagraph (c)(5): Perform a preconditioning drive by operating the test vehicle in charge-sustaining operation over the first 505 seconds of the UDDS cycle (~~bag~~phase 1), the last 867 seconds of the UDDS cycle (~~bag~~phase 2), or the SC03 driving schedule. If driver-selectable modes are available, do not activate the driver-selectable mode to be tested ~~shall be activated during~~for the preconditioning drive, but set the vehicle in default mode or normal mode for the preconditioning drive with the vehicle in charge-sustaining operation. If, however, the vehicle is to be tested in charge-increasing operation (this does not apply to a driver-selectable charge-increasing mode), then the initial SOC shall be set at the lowest normal SOC level allowed by the vehicle when driving on the UDDS cycle. If the air conditioning test sequence starts more than 2 hours after a different exhaust emission test, the vehicle may be driven over one full UDDS cycle for the preconditioning drive instead of over one of the cycles listed previously in this section (c)(5).

7.2.3 Subparagraphs (c)(6) through (d)~~(1)~~. [No change.]

7.2.4 Amend subparagraph (d)(1): Place the vehicle in gear 15 seconds after starting vehicle, which is 3 seconds before the first acceleration. If a driver-selectable mode is to be tested, start the vehicle, activate the driver-selectable mode, and place the vehicle in gear 15 seconds after starting vehicle. Follow the SC03 driving schedule.

7.2.~~4~~5 Amend subparagraph (d)(2): Turn the vehicle off 2 seconds after the end of the last deceleration. Five seconds after the vehicle stops running, stop all sampling and recording, including background sampling. Stop any integrating devices and indicate the end of the test cycle in the recorded data. Note that the 5 second delay is intended to account for sampling system transport. A valid test shall satisfy the SOC Net Energy Change Tolerances in section G.10 for the SC03 cycle with emission sampling. An option is allowed for PHEVs with charge-increasing operation where a test may be considered valid if the SOC at the end of the SC03 cycle with emission sampling is higher than the SOC at the beginning of the same SC03 cycle with emission sampling. If this option is used, then confirmatory and in-use compliance tests shall also be considered valid if the SOC at the end of the SC03 cycle with emission sampling is higher than the SOC at the beginning of the same SC03 cycle with emission sampling.

7.2.6 Subparagraphs (d)(3) through (f)(3)(iv). [No change.]

7.2.7 **Additional End-of-Test Criterion.** If the SOC Net Energy Change Tolerance is not satisfied for the SC03 cycle with emission sampling in section G.7.2.4, then the alternative End-of-Test criterion pursuant to 40 CFR §1066.501 may be used to validate testing with the following revisions:

7.2.7.1 Delete subparagraphs (a)(1) through (a)(2)(i).

7.2.7.2 Amend subparagraph (a)(2)(ii): The alternative End-of-Test criterion of ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010) may be used to validate an SC03 Emission Test with approval from the Executive Officer if the ±1% SOC Net Energy Change Tolerances in section G.10 are insufficient to validate testing. If the alternative End-of-Test criteria of ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010) is used to validate testing, then confirmatory and in-use compliance testing shall also be validated based on the ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010).

7.2.7.3 Amend subparagraph (a)(2)(iii): Appendix C of SAE J1711 (June 2010) may be used to correct CO_2 emissions and carbon-related exhaust emissions, but may not be used to correct measured values for criteria pollutant emissions.

7.2.7.4 Delete subparagraphs (a)(2)(iv) through (c).

* * * *

7.5~~3~~ Optional Cold Start US06 All-Electric Range Test.

7.5~~3~~.1 **Cold soak and vehicle charging.** The vehicle shall be stored at an ambient temperature not less than 68°F (20°C) and not more than 86°F (30°C) for 12 to 36 hours. During this time, the vehicle battery shall be charged to a full state-of-charge. The vehicle must be turned off during charging. Charge time shall not exceed soak time.

7.5~~3~~.2 At the end of the cold soak period with the vehicle in default mode or in normal mode if the vehicle does not have a default mode, ~~the vehicle shall be~~ place~~d~~ or push~~ed~~ the vehicle onto a dynamometer, and ~~shall be driven on~~ drive the vehicle on a continuous US06 test cycle until either:

(a) the auxiliary power unit starts, or

(b) the vehicle can no longer meet the speed trace limits of the US06 driving schedule as specified in CFR 86 Appendix I to within 2 mph higher than the highest point on the trace within 1 second for the upper limit or within 2 mph lower than the lowest point on the trace within 1 second for the lower limit.

When either of these conditions is met, the test shall be ended. The range for this test, in miles, shall be the distant driven from the start of the test to when condition (a) or (b) is met. Emission sampling is not required for this test.

* * * *

8. 50°F and 20°F Test Provision for Off-Vehicle Charge Capable Hybrid Electric Vehicles.

* * * *

8.1 To satisfy test requirements for the 50°F emission test, ~~the~~ a vehicle shall be emission tested in the vehicle operation and driver-selectable mode (if available) that represents the worst case urban ~~(~~NMOG + NOx~~)~~ emissions ~~of the urban charge depleting range emission test or urban charge sustaining emission test~~ as ~~defined~~determined in section G.5. To satisfy test requirements for the 20°F emission test, ~~the~~ a vehicle shall be emission tested in the vehicle operation and driver-selectable mode (if available) that represents the worst case ~~(~~CO~~)~~ emissions of the urban charge-depleting ~~range~~ emission test or urban charge-sustaining emission test ~~as defined~~ following the procedure outlined in section G.5. For the 20°F and 50°F emission tests, ~~the~~ a vehicle is not required to meet SOC net energy change tolerances. If a vehicle qualifies for the Urban Alternative Charge-Depleting Emission Test, the 50°F and 20°F emission test shall be performed using the Alternative Charge-Depleting Emission Test in lieu of the urban charge-depleting emission test or urban charge-sustaining emission test.

8.2 If the worst case for emissions is charge-sustaining operation, the vehicle shall be preconditioned, and one of the following two emission test options must be performed.

* * * *

(ii) A two phase test that includes phase one as a UDDS cycle, a 10 minute key-off soak period, and phase two as a UDDS cycle. Emission weighting for the four phase test will follow the procedure outlined in section G.5.5~~.1~~.

* * * *

10. State-of-Charge Net Energy Change Tolerances.

10.1 For vehicles that use a battery as an energy storage device, the following state-of-charge net energy change tolerance shall apply ~~for charge-sustaining emission tests~~:

* * * *

An alternate state-of-charge net energy change tolerance may be used if shown to be technically necessary and if approved in advance by the Executive Officer of the Air Resources Board.

10.2 For vehicles that use a capacitor as an energy storage device, the following state-of-charge net energy change tolerance shall apply ~~for charge-sustaining emission tests~~:

* * * *

10.3 For vehicles that use an electro-mechanical flywheel as an energy storage device, the following state-of-charge net energy change tolerance shall apply ~~for charge-sustaining emission tests~~:

* * * *