

ENCLOSURE A

PROPOSED SECOND 15-DAY MODIFICATIONS TO 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 second 15-day modifications to section 1961.2, 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 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 underline to indicate additions and ~~strikeout~~ to indicate deletions. Modifications to the originally proposed language made available in connection with the first “15-Day Notice” are shown in double underline to indicate additions and ~~double strikeout~~ to indicate deletions. Supplemental modifications being made in connection with this second “15-Day Notice” are shown in dotted underline to indicate additions and ~~italics 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, 1976, and 1978, title 13, CCR or to the incorporated test procedures except as noted above.

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.

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(a) *Exhaust Emission Standards.*

* * * *

(7) *Supplemental Federal Test Procedure (SFTP) Off-Cycle Emission Standards.*

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(B) *SFTP PM Exhaust Emission Standards for Passenger Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles.* The following standards are the maximum PM exhaust emissions through the full useful life from 2017 and subsequent model-year LEV III LEVs, ULEVs, and SULEVs in the PC, LDT, and MDPV classes when operating on the same gaseous or liquid fuel they use for FTP certification. In the case of fuel-flexible vehicles ≤ 6,000 lbs. GVWR certified to LEV III FTP standards prior to model year 2017 and fuel-flexible vehicles > 6,000 lbs. GVWR certified to LEV III FTP standards prior to model year 2018, these standards only apply when the vehicles is operating on SFTP compliance shall be demonstrated using the LEV III certification gasoline specified in Part II, Section A.100.3.1.2 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.” 2017 and subsequent model year multi-fueled vehicles (including bi-fueled, dual-fueled and fuel-flexible vehicles) ≤ 6,000 lbs. GVWR and 2018 and subsequent model year multi-fueled vehicles > 6,000 lbs. GVWR, including vehicles certifying with carryover data, shall comply with all requirements established for each consumed fuel (or blend of fuels in the case of fuel-flexible vehicles). Manufacturers must certify LEVs, ULEVs, and SULEVs in the PC, LDT, and MDPV classes, which are certifying to LEV III FTP PM emission standards in subsection (a)(2) on a 150,000-mile durability basis, to the *SFTP PM Exhaust Emission Standards* set forth in this subsection (a)(7)(B).

SFTP PM Exhaust Emission Standards for 2017 and Subsequent Model LEV III Passenger Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles¹					
Vehicle Type	Test Weight	Mileage for Compliance	Test Cycle	PM _{2.5} (mg/mi)	
				<u>2018 and Prior Model Years</u>	<u>2019 and Subsequent Model Years</u>
All PCs and LDTs through 8,500 lbs GVWR; MDPVs LDTs 0-6,000 lbs GVWR	Loaded vehicle weight	150,000	US06	10	<u>6</u>
LDTs 6,001-8,500 lbs GVWR; MDPVs	Loaded vehicle weight	150,000	US06	20	

¹ All PCs, LDTs, and MDPVs certified to LEV III FTP PM emission standards in subsection ~~E 1124 (a)(2)~~ on a 150,000-mile durability basis shall comply with the SFTP PM Exhaust Emission Standards in this table.

* * * *

(C) *SFTP NMOG+NOx and CO Exhaust Emission Standards for Medium-Duty Vehicles.* The following standards are the maximum NMOG+NOx and CO composite emission values for full useful life of 2016 and subsequent model-year medium-duty LEV III ULEVs and SULEVs from 8,501 through 14,000 pounds GVWR when operating on the same gaseous or liquid fuel they use for FTP certification. In the case of flex-fueled vehicles certified to LEV III FTP standards prior to model year 2018, SFTP compliance shall be demonstrated using the LEV III certification gasoline specified in Part II, Section A.100.3.1.2 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.” 2018 and subsequent model year multi-fueled vehicles (including bi-fueled, dual-fueled and fuel-flexible vehicles), including vehicles certifying with carryover data, shall comply with all requirements established for each consumed fuel (or blend of fuels in the case of fuel-flexible vehicles). The following composite emission standards do not apply to MDPVs subject to the emission standards presented in subsections (a)(7)(A) and (a)(7)(B).

SFTP NMOG+NOx and CO Composite Exhaust Emission Standards for 2016 and Subsequent Model ULEVs and SULEVs in the Medium-Duty Vehicle Class						
Vehicle Type	Mileage for Compliance	HP/GVWR ²	Test Cycle ^{3,4,5}	Vehicle Emission Category ⁶	Composite Emission Standard ¹ (g/mi)	
					NMOG + NOx	Carbon Monoxide
MDVs 8,501 - 10,000 lbs GVWR	150,000	≤ 0.024	US06 Bag 2, SC03, FTP	ULEV	0.550	22.0
				SULEV	0.350	12.0
		> 0.024	Full US06, SC03, FTP	ULEV	0.800	22.0
				SULEV	0.450	12.0
MDVs 10,001-14,000 lbs GVWR	150,000	n/a	Hot 1435 UC (Hot 1435 LA92), SC03, FTP	ULEV	0.550	6.0
				SULEV	0.350	4.0

* * * *

⁶ *Vehicle Emission Categories.* For MDVs 8,501-10,000 lbs. GVWR certified prior to the 2018 model year, for each model year, the percentage of MDVs certified to an SFTP emission category set forth in this section 1961.2 shall be equal to or greater than the total percentage certified to the FTP ULEV250, ULEV200, SULEV170, and SULEV150 emission categories; of these vehicles, the percentage of MDVs certified to an SFTP SULEV emission category shall be equal to or greater than the total percentage certified to both the FTP SULEV170 and SULEV150 emission categories. For MDVs 10,001-14,000 lbs. GVWR, for each model year, the percentage of MDVs certified to an SFTP emission category set forth in this section 1961.2 shall be equal to or greater than the total percentage certified to the FTP ULEV400, ULEV270, SULEV230, and SULEV200 emission categories; of these vehicles, the percentage of MDVs certified to an SFTP SULEV emission category shall be equal to or greater than the total percentage certified to both the FTP SULEV230 and SULEV200 emission categories. 2018 and subsequent model year MDVs 8,501-10,000 lbs. GVWR certifying to the FTP ULEV250 and ULEV200 emission categories, including vehicles certifying with carryover data, shall comply with the SFTP ULEV standards set forth in this subsection ~~E-1.2.2.3~~ (a)(7)(C), and those certifying to FTP SULEV170 and SULEV150, including vehicles certifying with carryover data, shall comply with the SFTP SULEV standards set forth in this subsection ~~E-1.2.2.3~~ (a)(7)(C). 2018 and subsequent model year MDVs 10,001-14,000 lbs. GVWR certifying to FTP ULEV400 and ULEV270 emission categories, including vehicles certifying with carryover data, shall comply with the SFTP ULEV standards set forth in this subsection ~~E-1.2.2.3~~ (a)(7)(C), and those certifying to SULEV230 and SULEV200, including vehicles certifying with carryover data, shall comply with the SFTP SULEV standards set forth in this subsection ~~E-1.2.2.3~~ (a)(7)(C).

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

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(4) *SFTP Phase-In Requirements.*

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(B) *Phase-In Requirements for Medium-Duty Vehicle Manufacturers.* Phase-in for NMOG+NO_x and CO emission standards begins with the 2016 model year. For MDVs 8,501-10,000 lbs. GVWR certified prior to the 2018 model year, for each model year, the percentage of MDVs certified to an SFTP emission category set forth in this section 1961.2 shall be equal to or greater than the total percentage certified to the FTP ULEV250, ULEV200, SULEV170, and SULEV150 emission categories; of these vehicles, the percentage of MDVs certified to an SFTP SULEV emission category shall be equal to or greater than the total percentage certified to both the FTP SULEV170 and SULEV150 emission categories. For MDVs 10,001-14,000 lbs. GVWR, for each model year, the percentage of MDVs certified to an SFTP emission category set forth in this section 1961.2 shall be equal to or greater than the total percentage certified to the FTP ULEV400, ULEV270, SULEV230, and SULEV200 emission categories; of these vehicles, the percentage of MDVs certified to an SFTP SULEV emission category shall be equal to or greater than the total percentage certified to both the FTP SULEV230 and SULEV200 emission categories. 2018 and subsequent model year MDVs 8,501-10,000 lbs. GVWR certifying to the FTP ULEV250 and ULEV200 emission categories, including vehicles certifying with carryover data, shall comply with the SFTP ULEV standards set forth in ~~this~~ subsection ~~E.1.2.2.3~~ (a)(7)(C), and those certifying to FTP SULEV170 and SULEV150, including vehicles certifying with carryover data, shall comply with the SFTP SULEV standards set forth in ~~this~~ subsection ~~E.1.2.2.3~~ (a)(7)(C). 2018 and subsequent model year MDVs 10,001-14,000 lbs. GVWR certifying to FTP ULEV400 and ULEV270 emission categories, including vehicles certifying with carryover data, shall comply with the SFTP ULEV standards set forth in ~~this~~ subsection ~~E.1.2.2.3~~ (a)(7)(C), and those certifying to SULEV230 and SULEV200, including vehicles certifying with carryover data, shall comply with the SFTP SULEV standards set forth in ~~this~~ subsection ~~E.1.2.2.3~~ (a)(7)(C).

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California Environmental Protection Agency
AIR RESOURCES BOARD

PROPOSED SECOND 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 second 15-day 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. Modifications to the originally proposed language made available in connection with the first "15-Day Notice" are shown in double underline to indicate additions and ~~double strikeout~~ to indicate deletions. Supplemental modifications being made in connection with this second "15-Day Notice" are shown in dotted underline to indicate additions and ~~italics 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 proposed for incorporation herein without change. Existing intervening text that is not amended in this rulemaking is indicated by "*** * * *".

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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

A. General Applicability

1. §86.1801 Applicability.

1.1 §86.1801-12. ~~October 15, 2012~~ April 28, 2014 ~~February 19, 2015~~. Amend as follows:

* * * *

B. Definitions, Acronyms and Abbreviations

1. §86.1803 Definitions.

1.1 §86.1803-01. ~~October 15, 2012~~ April 28, 2014 ~~August 8, 2014~~ ~~February 19, 2015~~. [No change, except as otherwise noted below.]

* * * *

C. General Requirements for Certification

1. §86.1805 Useful Life.

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1.2 §86.1805-17. ~~April 28, 2014~~ February 19, 2015. Amend as follows:

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G. Procedures for Demonstration of Compliance with Emission Standards

* * * *

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

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3.2 §86.1829-15. ~~April 28, 2014~~ February 19, 2015. Amend as follows:

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H. Certification, Information and Reporting Requirements.

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4. §86.1844 Information Requirements: Application for Certification and Submittal of Information Upon Request.

4.1 §86.1844-01. ~~September 15, 2011~~ April 28, 2014 February 19, 2015. Amend as follows:

* * * *

4.1.2 Modify §86.1844-01(d) as follows:

(a) Modify §86.1844-01 (d)(7)(i) as follows: For vehicles certified to any LEV III emission standards, include a comparison of drive-cycle metrics as specified in 40 CFR 1066.425(i) for each drive cycle or test phase, as appropriate.

~~(a)~~ Delete §86.1844-01(d)(9).

~~(c)~~ §86.1844-01(d)(11)(iii). Delete; Replace with: For 2017 and subsequent model vehicles with spark-ignition engines, describe how AECDs are designed to comply with the requirements of section D.2.7. Identify which components need protection through enrichment strategies; describe the temperature limitations for those components; and describe how the enrichment strategy corresponds to those temperature limitations.

~~(b)~~ Delete §86.1844-01(d)(15)(ii) and replace it with the following: For vehicles with fuel fired heaters, a manufacturer must include the information specified in section H.4.4.

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I. In-Use Compliance Requirements and Procedures

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

1.1 §86.1845-04. ~~May 7, 2010~~ ~~April 28, 2014~~ February 19, 2015. Amend as follows:

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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.

100.1 General applicability.

86.101 General applicability. ~~October 6, 2000~~ ~~April 28, 2014~~ February 19, 2015. No change except as follows.

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100.3 Certification Fuel Specifications.

* * * *

86.113-04 Fuel Specifications. ~~February 10, 2000~~ ~~April 28, 2014~~ February 19, 2015.

* * * *

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~~February 19, 2015) 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~~February 19, 2015), exhaust emission testing shall be conducted by the manufacturer with gasoline having the specifications in 40 CFR §1065.710(b) (~~April 28, 2014~~February 19, 2015), and the Executive Officer shall conduct exhaust emission testing with gasoline having the specifications in section 40 CFR §1065.710(b) (~~April 28, 2014~~February 19, 2015). 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~~February 19, 2015). 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~~February 19, 2015), the Executive Officer shall conduct exhaust emission testing with gasoline having the specifications set forth in 40 CFR §1065.710(b) (~~April 28, 2014~~February 19, 2015). 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.”

* * * *

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

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100.3.4.3 ~~Add the following subparagraphs.~~ **Evaporative 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, the fuel for evaporative emission testing shall be the gasoline set forth in Part II, Section A.100.3.1.2 of these test procedures. A manufacturer may alternatively demonstrate compliance with the applicable evaporative emission standards using gasoline test fuel meeting the specifications set forth in 40 CFR §1065.710 15(b) (~~April 28, 2014~~ February 19, 2015) if the manufacturer also uses the evaporative emission test procedures set forth in 40 CFR §§86.107 96 through 86.143 96 in place of the test procedures set forth in the “California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles.” Alternative alcohol-gasoline blends may be used in place of E10 if demonstrated to result in equivalent or higher evaporative emissions, subject to prior approval of the Executive Officer. For refueling testing, the test fuel shall be the fuel specified in the “California Refueling Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles.”

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B. 40 CFR Part 86, Subpart C - Emission Regulations for 1994 and Later Model Year Gasoline-Fueled New Light-Duty Vehicles, New Light-Duty Trucks and New Medium-Duty Passenger Vehicles; Cold Temperature Test Procedures.

86.201-11 General applicability. ~~December 27, 2006~~ ~~April 28, 2014~~ February 19, 2015.

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86.213-11 Fuel specifications. ~~December 27, 2006~~ ~~April 28, 2014~~ February 19, 2015.

* * * *

Appendix I to Part 86 -- Urban Dynamometer Schedules. ~~April 29, 1998~~ ~~April 28, 2014~~ February 19, 2015.

C. 40 CFR Part 1066 – Vehicle-Testing Procedures.

* * * *

1. Subpart A – Applicability and General Provisions.

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1066.10 Other procedures. ~~April 28, 2014~~ February 19, 2015.

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2. Subpart B – Equipment, Measurement Instruments, Fuel, and Analytical Gas Specifications.

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1066.1225 Data updating, recording, and control ~~for measurement instruments~~. April 28, 2014.

* * * *

3. Subpart C – Dynamometer Specifications.

* * * *

1066.235 Speed verification procedure. ~~April 28, 2014~~ February 19, 2015.

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1066.255 Parasitic loss verification. ~~April 28, 2014~~ February 19, 2015.

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1066.270 Unloaded coastdown verification. ~~April 28, 2014~~ February 19, 2015.

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4. Subpart D – Coastdown.

1066.301 Overview of ~~coastdown~~ road-load determination procedures. ~~April 28, 2014~~ February 19, 2015.

1066.305 ~~Coastdown~~ Procedures for specifying road-load forces for motor vehicles at or below 14,000 pounds GVWR. ~~April 28, 2014~~ February 19, 2015.

* * * *

5. Subpart E – Preparing Vehicles and Running an Exhaust Emission Test.

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1066.410 Dynamometer test procedure. ~~April 28, 2014~~ February 19, 2015.

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1066.420 Test preparation. ~~April 28, 2014~~ February 19, 2015.

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7. Subpart G – Calculations.

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1066.605 Mass-based and molar-based exhaust emission calculations. ~~April 28, 2014~~ February 19, 2015.

* * * *

1066.615 NOx intake-air humidity correction. ~~April 28, 2014~~ February 19, 2015.

* * * *

1066.635 NMOG determination. ~~April 28, 2014~~ February 19, 2015. [n/a]

* * * *

8. Subpart H – Cold-Temperature Test Procedures.

1066.701 Applicability and general provisions. ~~April 28, 2014~~ February 19, 2015.

1066.710 Cold-temperature testing procedures for measuring CO and NMHC emissions and determining fuel economy. ~~April 28, 2014~~ February 19, 2015.

9. Subpart I – Exhaust Emission Test Procedures for Motor Vehicles.

1066.801 Applicability and general provisions. ~~April 28, 2014~~ February 19, 2015.

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1066.815 Exhaust emission test procedures for FTP ~~emission~~testing. ~~April 28, 2014~~February 19, 2015.

* * * *

1066.831 Exhaust emission test procedures for aggressive driving. ~~April 28, 2014~~February 19, 2015.

* * * *

1066.835 Exhaust emission test procedures for SC03 emissions. ~~April 28, 2014~~February 19, 2015.

* * * *

1066.845 AC17 Air conditioning efficiency test procedure. ~~April 28, 2014~~February 19, 2015.

10. Subpart K – Definitions and Other Reference Material.

1066.1001 Definitions. ~~April 28, 2014~~February 19, 2015.

1066.1005 Symbols, abbreviations, acronyms, and units of measure. ~~April 28, 2014~~February 19, 2015.

1066.1010 Incorporation by ~~r~~Reference materials. ~~April 28, 2014~~February 19, 2015.

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California Environmental Protection Agency
AIR RESOURCES BOARD

PROPOSED SECOND 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]

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

* * * *

**PART I. GENERAL CERTIFICATION REQUIREMENTS FOR EVAPORATIVE
EMISSIONS**

* * * *

C. Useful Life

1. ~~§86.1805-0417 (April 28, 2014)~~(February 19, 2015). Delete. For vehicles certified to the emission standards in section I.E.1.(a), "useful life" shall have the same meaning as provided in section 2112, title 13, CCR. Except as provided below, for ~~For~~ vehicles certified to the emission standards in sections I.E.1.(c), I.E.1.(d), and I.E.1.(e), the "useful life" shall be 15 years or 150,000 miles, whichever first occurs. For 2016 and previous model vehicles, 2017 and previous model vehicles >6,000 lbs. GVWR, and 2021 and previous model vehicles certified by a small volume manufacturer, the canister bleed standards are certification standards only.

* * * *

D. General Standards; increase in emissions; unsafe conditions; waivers

1. Light- and Medium-Duty Vehicles.

1.1. Amend §86.1810-01 (~~December 8, 2005 (April 28, 2014)~~(February 19, 2015)) as follows:

* * * *

2. Heavy-Duty Vehicles. Approval of heavy-duty vehicles over 14,000 lbs. GVWR and incomplete medium-duty vehicles shall be based on:

2.1. §1037.103 (c) (April 28, 2014)(February 19, 2015) The provisions of this paragraph also apply to incomplete medium-duty vehicles.

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3. Auxiliary engines and fuel systems

3.1. §86.1813-17 (e) ~~(April 28, 2014)~~(February 19, 2015) [No change]

* * * *

PART II. DURABILITY DEMONSTRATION

A. Light- and Medium-Duty Vehicles

1. Evaporative/refueling emission family determination. §86.1821-01
(April 28, 2014) [No change.]

2. Durability Demonstration Procedures for Evaporative Emissions

2.1. §86.1824-01 Amend as follows:

(a) and (b) Delete.

(c) [No change.]

(d) Delete.

(e) ~~[No change.]~~ Amend to read: *In-use verification and In-use confirmatory testing.* The durability program must meet the requirements of §86.1845-04 ~~(April 28, 2014)~~(February 19, 2015) and §86.1846-01 (April 28, 2014).

* * * *

5. Durability and Emission Testing Requirements; waivers

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5.5. §86.1829-15(e) ~~(April 28, 2014)~~(February 19, 2015) [Amend as follows:].

* * * *

PART III. EVAPORATIVE EMISSION TEST PROCEDURES FOR LIGHT- AND MEDIUM-DUTY VEHICLES

* * * *

C. Road Load Power, Test Weight, Inertia Weight Class, and Running Loss Fuel Tank Temperature Profile Determination

Amend 40 CFR §86.129-80 to include an additional section III.C.1. to read:

1. Determination of running loss test fuel tank temperature profile. The manufacturer shall establish for each combination of vehicle platform/powertrain/fuel tank submitted for certification a representative profile of fuel tank liquid and vapor temperature versus time to be used as the target temperature profile for the running loss evaporative emissions test drive cycle. If a vehicle has more than one fuel tank, a profile shall be established for each tank. If manufacturers use a vehicle model to develop a profile to represent multiple vehicle models, the vehicle model selected must have the greatest expected fuel liquid temperature and fuel vapor temperature increase during driving of all of the vehicle models it will represent. Manufacturers must select test vehicles with any available vehicle options that could increase fuel temperature during driving, such as any feature that limits underbody air flow. The profile shall be established by driving the vehicle on-road over the same driving schedule as is used for the running loss evaporative emissions test according to the following sequence:

* * * *

1.3. The vehicle fuel tank shall be drained and filled to 40 percent of the nominal tank capacity with fuel meeting the requirements of section III.D.1. of these procedures. For all hybrid electric vehicles, except for 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles, the battery state-of-charge shall be set at a level such that the auxiliary power unit would be activated by the vehicle's control strategy within 30 seconds of starting the first UDDS of the fuel tank temperature profile determination test sequence. If the auxiliary power unit is capable of being manually activated, the auxiliary power unit shall be manually activated at the beginning of and operating throughout the fuel tank temperature profile determination. For 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles, the battery state-of-charge shall be set at the level that results when the battery state-of-charge is initially set at the highest level allowed by the manufacturer and then decreased, as applicable, by the performance of a standard three-phase exhaust test. The vehicle shall be moved to the location where the driving cycle is to be conducted. It may be driven a maximum distance of 5.0 miles, longer distances shall require that the vehicle be transported by other means. For 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles, the vehicle shall be either only pushed or towed to avoid disturbing the battery state-of-charge setting. The vehicle shall be parked for a minimum of 12 hours in an open area on a surface that is representative of the test road. The orientation of the front of the vehicle during parking (N, SW, etc.) shall be documented. Once the 12-hour minimum parking time has been achieved and the ambient temperature and weather conditions and track surface temperature are within the allowable ranges, the vehicle engine shall be started. The vehicle air conditioning system (if so equipped) shall be set as described in 40 CFR §1066.835 (April 28, 2014)(February 19, 2015) to the "NORMAL" air conditioning mode and adjusted to the ~~minimum discharge air temperature and high fan speed. Vehicles equipped with automatic temperature controlled air conditioning systems shall be operated in~~

~~"AUTOMATIC" temperature and fan modes with the system set at 72°F. The vehicle may be operated at minimum throttle for periods up to 60 seconds prior to beginning the first UDDS cycle in order to move from the parking location onto the road surface. The driver's aid shall be started and the vehicle operated over one UDDS cycle, then two NYCCs, and another UDDS cycle. The end of each UDDS cycle and the end of the two NYCCs shall be followed by an idle period of 120 seconds during which the engine shall remain on with the vehicle in the same transmission range and clutch (if so equipped) actuation mode as specified in 40 CFR §86.128-79 (April 28, 2014) except for the following:~~

* * * *

D. Test Procedure

The test sequence described in 40 CFR §86.130 through §86.140 shall be performed with the following modifications:

* * * *

7. Vehicle Fuel Tank Temperature Stabilization

* * * *

7.3. ~~The vehicle air conditioning system (if so equipped) shall be set as described in 40 CFR §1066.835 (April 28, 2014) to the "NORMAL" air conditioning mode and adjusted to the minimum discharge air temperature and high fan speed. Vehicles equipped with automatic temperature controlled air conditioning systems shall be operated in "AUTOMATIC" temperature and fan modes with the system set at 72°F.~~ (February 19, 2015)

* * * *

8. Running Loss Test

8.1. If running loss testing is conducted using an enclosure which incorporates atmospheric sampling equipment, the manufacturer shall perform the following steps for each test:

* * * *

8.1.5. The fuel tank temperature sensor and the ambient temperature sensor shall be connected to the temperature recording system and, if required, to the air management and temperature controllers. The vehicle cooling fan shall be positioned

as described in 40 CFR §86.135-90(b). During the running loss test, the cover of the vehicle engine compartment shall be closed as much as possible, windows shall be closed, and air conditioning system (if so equipped) shall be operated according to the requirements of section III.C. (~~§86.129-80 (d)(3)~~) set as described in 40 CFR §1066.835 (April 28, 2014)(February 19, 2015). Vehicle coolant temperature shall be monitored to ensure adequate vehicle coolant air to the radiator intake(s). The temperature recording system and the hydrocarbon and alcohol emission data recording system shall be started.

* * * *

8.2. If running loss testing is conducted using a cell which incorporates point source sampling equipment, the manufacturer shall perform the following steps for each test:

* * * *

8.2.2. The vehicle cooling fan shall be positioned as described in 40 CFR §86.135-90(b). During the running loss test, the cover of the vehicle engine compartment shall be closed as much as possible, windows shall be closed, and air conditioning system (if so equipped) shall be operated according to the requirements of section III.C.1.3. (~~40 CFR §86.129-80~~) set as described in 40 CFR §1066.835 (April 28, 2014)(February 19, 2015). Vehicle coolant temperature shall be monitored to ensure adequate vehicle coolant air to the radiator intake(s).

* * * *

13. Effective Leak Diameter Test

13.1 To be conducted according to 40 CFR §1066.985 (April 28, 2014) (February 19, 2015).

* * * *

G. Alternative Test Procedures

1. For vehicles that are required to be certified using the test fuel in section III.F.1., a manufacturer may alternatively demonstrate compliance with the applicable evaporative emission standards using a gasoline test fuel meeting the specifications set forth in 40 CFR §86.113-9404(a)(1) (~~April 28, 2014~~)(February 19, 2015) if the manufacturer also uses the evaporative emission test procedures set forth in 40 CFR §§86.107-96 through 86.143-96 in place of the test procedures set forth in these test procedures.

2. For vehicles that are required to be certified using California gasoline test fuel, a manufacturer may alternatively demonstrate compliance with the applicable evaporative emission standards using a gasoline test fuel meeting the specifications set forth in 40 CFR §1065.710-15(b) ~~(April 28, 2014)~~ (February 19, 2015) if the manufacturer also uses the evaporative emission test procedures set forth in 40 CFR §§86.107-96 through 86.143-96 in place of the test procedures set forth in these test procedures.

2.1. If gasoline test fuel meeting the specifications set forth in 40 CFR §1065.710-15(b) ~~(April 28, 2014)~~ (February 19, 2015) is used in the Bleed Emission Test Procedure (BETP), then both the fuel tank soak set forth in section III.D.12.2 and the fuel tank/canister assembly soak set forth in section III.D.12.6 shall occur at $72 \pm 3^{\circ}\text{F}$, and the diurnal temperature profile shall be as specified in 40 CFR Appendix II. Otherwise, the BETP procedure, as specified in these test procedures, shall be used.

* * * *

California Environmental Protection Agency
AIR RESOURCES BOARD

PROPOSED SECOND 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 second 15-day 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. Modifications to the originally proposed language made available in connection with the first "15-Day Notice" are shown in double underline to indicate additions and ~~double strikeout~~ to indicate deletions. Supplemental modifications being made in connection with this second "15-Day Notice" are shown in dotted underline to indicate additions and ~~italics 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 proposed for incorporation herein without change. Existing intervening text that is not amended is indicated by "* * * *".

* * * *

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

* * * *

8. The specifications for the fuel used in certification or in-use testing are set forth in Table 2 below. ~~40 CFR §86.113-94 [February 18, 2000]. Alternatively, California certification fuel specified in Part II, A.100.3.1.2 (test fuel with 10 percent ethanol) 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” may be used for 2015 and subsequent model vehicles for certification or in-use testing as long as California temperatures are applied as described in Subpart B, section II.B.5.2.~~

Table 2: Test Fuel

<u>Vehicle Model Year</u>	<u>Permissible Test Fuels ⁽¹⁾</u>
<u>Up through 2016</u>	<u>Federal E0, Federal E10, or California E10⁽²⁾</u>
<u>2017 and subsequent</u>	<u>Federal E10 or California E10⁽²⁾ for vehicles that are required to use California E10 or Federal E10 for certification to the evaporative emission standards of “California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles .”</u> <u>Federal E0, Federal E10, or California E10⁽²⁾ for vehicles that are not required to use California E10</u>

	or Federal E10 for certification to the evaporative emission standards of “California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles.”
--	---

- (1) For flex-fueled vehicles, the fuel blend set forth in 40 CFR §86.1810-17(h)(2) ~~(April 28, 2014)~~(February 19, 2015) may be used in lieu of the permissible test fuels set forth in Table 2.
- (2) When using California E10 test fuel, California temperatures shall be applied as described in Subpart B, section II.B.5.2.

B. Definitions, Acronyms, Terminology

* * * *

3. “Federal E0” means the test fuel set forth in 40 CFR ~~§~~§1065.710(c) ~~(April 28, 2014)~~(February 19, 2015).

4. “Federal E10” means the test fuel set forth in 40 CFR §1065.710(b) ~~(April 28, 2014)~~(February 19, 2015).

* * * *

E. General Standards, increase in emissions; unsafe conditions; waivers

- 1. Amend §86.1810-01 [July 12, 2001 ~~(April 28, 2014)~~(February 19, 2015)] as follows:

* * * *

1.3. (l) Substitute certification to the applicable refueling emission standards set forth in section ~~I~~.F. of these test procedures instead of with the standards set forth in §86.1811-04(e); §86.1812-01(e); §86.1813-01(e); and, §86.1816-05(e).

* * * *

G. Durability Demonstration procedures for refueling emissions.

- 1. §86.1825-01 Durability Demonstration procedures for refueling emissions [October 6, 2000] [No change.]
- 2. Amend §86.1829-15(e) Durability and emission testing requirements; waivers. ~~(April 28, 2014)~~(February 19, 2015) as follows:

2.1. (1) [No change.]

- 2.2. (2) [No change.]
- 2.3. (3) [No change.]
- 2.4. (4) See the “California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles.”
- 2.5. (5) [No change.]
- 2.6. (6) See the “California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles.”
- 2.7. (7) [Delete]
- 2.8. (8) [Delete]
- 2.9. (9) [No change.]

* * * *

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

* * * *

II. Refueling Emissions Test Procedures

* * * *

B. Refueling Emissions

* * * *

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

* * * *

4.4.3. 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”~~ in 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.

* * * *

State of California
AIR RESOURCES BOARD

PROPOSED SECOND 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 second 15-day 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. Modifications to the originally proposed language made available in connection with the first "15-Day Notice" are shown in double underline to indicate additions and ~~double-strikeout~~ to indicate deletions. Supplemental modifications being made in connection with this second "15-Day Notice" are shown in dotted underline to indicate additions and ~~italics 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 "* * * * *".

* * * *

**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**

* * * *

**35. Labeling. [§86.xxx-35]
A. Federal provisions.**

* * * *

2. §86.007-35. August 30, 2006, ~~April 28, 2014~~ February 19, 2015. [No
change, except as noted above for §86.001-35.]

* * * *

Part II. OTHER REQUIREMENTS; TEST PROCEDURES

* * * *

PART 1065 – ENGINE-TESTING PROCEDURES.

Subpart A – Applicability and General Provisions.

* * * *

1065.10 Other procedures. April 30, 2010, ~~April 28, 2014~~ February 19, 2015.

* * * *

Subpart E – Engine Selection, Preparation, and Maintenance.

* * * *

1065.410 Maintenance limits for stabilized test engines. ~~June 30, 2008, April 28, 2014~~ February 19, 2015.

* * * *

Subpart G – Calculations and Data Requirements.

* * * *

1065.610 Duty cycle generation. ~~June 17, 2013, April 28, 2014~~ February 19, 2015.

* * * *

1065.650 Emission calculations. ~~September 15, 2011, April 28, 2014~~ February 19, 2015.

* * * *

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

* * * *

1065.710 Gasoline. ~~June 30, 2008, April 28, 2014~~ February 19, 2015.

* * * *

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

* * * *

(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).

California Certification Gasoline Specifications for the 2020 and Subsequent Model Years		
Fuel Property^(a)	Limit	Test Method^(b)
Octane (R+M)/2 ⁽ⁱ⁾	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 ^(c)
10% point	130-150 °F	
50% point ^(d)	205-215 °F	
90% point ^(e)	310-320 °F	
EP, maximum	390 °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. % ^(f)	§2263, title 13 CCR
Multi-substituted Alkyl Aromatic Hydrocarbons	13-15 vol. % ^(g)	
MTBE	0.05 vol. %	§2263, title 13 CCR
Ethanol	9.8-12.0 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 ^(h)	
Heat of Combustion	Report ^(h)	

Carbon	Report wt. % ^(h)	
Hydrogen	Report wt. % ^(h)	

* * * *

State of California
AIR RESOURCES BOARD

PROPOSED SECOND 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 second 15-day 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. Modifications to the originally proposed language made available in connection with the first "15-Day Notice" are shown in double underline to indicate additions and ~~double strikeout~~ to indicate deletions. Supplemental modifications being made in connection with this second "15-Day Notice" are shown in dotted underline to indicate additions and ~~italics 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 "* * * *".

* * * *

**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**

**I. GENERAL PROVISIONS FOR CERTIFICATION AND IN-USE VERIFICATION
OF EMISSIONS.**

§86.1 Incorporation by reference materials. ~~September 15, 2011~~ ~~April 28, 2014~~
~~February 19, 2015.~~

* * * *

**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.**

* * * *

35. Labeling. [§86.xxx-35].

A. Federal Provisions.

* * * *

2. **§86.007-35.** ~~August 30, 2006~~ ~~April 28, 2014~~ ~~February 19, 2015.~~

* * * *

PART 1065 – ENGINE-TESTING PROCEDURES.

Subpart A – Applicability and General Provisions

* * * *

1065.10 Other procedures. ~~April 30, 2010~~ ~~April 28, 2014~~ ~~February 19, 2015.~~

* * * *

Subpart E – Engine Selection, Preparation, and Maintenance

* * * *

1065.410 Maintenance limits for stabilized test engines. ~~June 30, 2008~~ April 28, 2014 February 19, 2015.

* * * *

Subpart G – Calculations and Data Requirements

* * * *

1065.610 Duty cycle generation. ~~June 17, 2013~~ April 28, 2014 February 19, 2015.

* * * *

1065.650 Emission calculations. ~~September 15, 2011~~ April 28, 2014 February 19, 2015.

* * * *

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

* * * *

1065.710 Gasoline. ~~June 30, 2008~~ April 28, 2014 February 19, 2015. [n/a]

* * * *

California Environmental Protection Agency
AIR RESOURCES BOARD

PROPOSED SECOND 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 second 15-day modifications to these test procedures as originally proposed September 2, 2014. Unless otherwise indicated below, the text of the originally proposed regulatory language is shown in underline to indicate additions and ~~strikeout~~ to indicate deletions compared to the test procedures as amended May 30, 2014. Modifications to the originally proposed language made available in connection with the first "15-Day Notice" are shown in double underline to indicate additions and ~~double strikeout~~ to indicate deletions. Supplemental modifications being made in connection with this second "15-Day Notice" are shown in dotted underline to indicate additions and ~~italics double strikeout~~ to indicate deletions. [No change] indicates proposed federal provisions that are also proposed for incorporation herein without change. Existing intervening text that is not amended in this rulemaking is indicated by "* * * *".

* * * *

CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 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.

* * * *

~~“Default Mode” means the operating mode that the vehicle automatically selects when the vehicle is turned on if the driver does not manually select an alternative mode.~~

“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 chooses to use an alternative mode.

* * * *

“Grid-connected hybrid electric vehicle” means a hybrid electric vehicle that has the capacity for the battery to be recharged from an off-board source of electricity and has some all-electric range. This type of hybrid electric vehicle is also called a plug-in hybrid electric vehicle or PHEV.

* * * *

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.

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 2004 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. Unless otherwise noted,

these requirements shall apply to all ZEVs (including fuel cell vehicles and hybrid fuel cell vehicles) and all HEVs, except off-vehicle charge capable HEVs.

Migration of the test procedures for measuring exhaust emissions from 40 CFR Part 86 to 40 CFR Part 1066 and from 40 CFR Part 600 to 40 CFR Part 1066 shall be done in accordance with Part II, Subpart A, section 100.1 and Part I, Subpart B, section 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," unless otherwise noted.

A manufacturer of a hybrid vehicle equipped with an energy storage device that is not included in these procedures may request Executive Officer approval to employ an alternative to the SOC Criterion in section F.9. Executive Officer approval of an SOC Criterion alternative shall be conditioned upon the manufacturer providing supporting data and/or engineering evaluation demonstrating the equivalence of the proposed alternative procedure to the SOC Criterion.

1. Electric Dynamometer. All ZEVs and HEVs ~~must~~ ~~may~~ must be tested using an ~~48-inch single roll~~ electric dynamometer meeting the requirements of 40 CFR Part 1066 Subpart C ~~April 28, 2014~~ Subpart B, §86.108-00(b)(2) [October 22, 1996].

* * * *

3. All-Electric Range Test for Zero-Emission Vehicles (including Fuel Cell Vehicles and Hybrid Fuel Cell Vehicles). All 2012~~8~~ and subsequent model ZEVs shall be subject to the All-Electric Range Test specified below for the purpose of determining the energy efficiency and operating range of the ZEV.

3.1 Determination of Urban All-Electric Range for Zero-Emission Vehicles.

3.1.1 ~~Determination of Urban All-Electric Range~~ Test for Battery Electric Vehicles.

* * * *

(b) At the end of the cold soak period, the vehicle shall be placed or pushed, onto a dynamometer and operated through successive Urban Dynamometer Driving Schedules (UDDS), 40 CFR, Part 86, Appendix I [~~July 13, 2005~~ ~~April 28, 2014~~ February 19, 2015], which is incorporated herein by reference. A 10-minute soak shall follow each UDDS.

(c) For vehicles with a maximum speed greater than or equal to the maximum speed on the UDDS cycle, this test sequence shall be repeated until the vehicle is no longer able to maintain either the speed or time tolerances in 40 CFR §86.115-0078 (b)(1) and (2) ~~[October 22, 1996-April 28, 2014]~~ or in 40 CFR §1066.425 ~~[April 28, 2014]~~, as applicable, in accordance with 40 CFR §86.101 ~~[April 28, 2014]~~, or the manufacturer determines that the test should be terminated for safety reasons, e.g. excessively high battery temperature, abnormally low battery voltage, etc.

(d) For vehicles with a maximum speed less than the maximum speed on the UDDS cycle, the vehicle shall be operated at maximum available power (or full throttle) when the vehicle cannot achieve the speed trace within the speed and time tolerances specified in 40 CFR §86.115-00(b)(1) and (2) ~~[October 22, 1996]~~ §1066.425 ~~[April 28, 2014]~~, as applicable, in accordance with 40 CFR §86.101 ~~[April 28, 2014]~~. The test shall be terminated when the vehicle speed when operated at maximum available power (or full throttle) falls below 95 percent of the maximum speed initially achieved on the UDDS cycle or when the battery state-of-charge is depleted to the lowest level allowed by the manufacturer, or the manufacturer determines that the test should be terminated for safety reasons, e.g. excessively high battery temperature, abnormally low battery voltage, etc., whichever occurs first.

* * * *

3.2 Determination of Highway All-Electric Range for Zero-Emission Vehicles and Range for Fuel Cell Vehicles and Hybrid Fuel Cell Vehicles.

3.2.1 ~~Determination of Highway All-Electric Range~~ Test for Battery Electric Vehicles.

* * * *

(c) For vehicles with a maximum speed greater than or equal to the maximum speed on the HFEDS cycle, this test sequence shall be repeated until the vehicle is no longer able to maintain either the speed or time tolerances in 40 CFR §86.115-00 (b)(1) and (2) ~~[October 22, 1996]~~ 40 CFR §1066.425 ~~[April 28, 2014]~~ in accordance with 40 CFR §86.101 ~~[April 28, 2014]~~, or the manufacturer determines that the test should be terminated for safety reasons, e.g. excessively high battery temperature, abnormally low battery voltage, etc.

(d) For vehicles with a maximum speed less than the maximum speed on the HFEDS cycle, the vehicle shall be operated at maximum available power (or full throttle) when the vehicle cannot achieve the speed trace within the speed

and time tolerances specified in 40 CFR §86.115-00 (b)(1) and (2) ~~[October 22, 1996]~~ 40 CFR §1066.425 ~~[April 28, 2014]~~, ~~as applicable,~~ in accordance with 40 CFR §86.101 ~~[April 28, 2014]~~. The test shall be terminated when the vehicle speed when operated at maximum available power (or full throttle) falls below 95 percent of the maximum speed initially achieved on the HFEDS or when the battery state-of-charge is depleted to the lowest level allowed by the manufacturer, or the manufacturer determines that the test should be terminated for safety reasons, e.g. excessively high battery temperature, abnormally low battery voltage, etc., whichever occurs first.

* * * *

3.5 Measurement Accuracy. For battery electric vehicles, the overall error in voltage and current recording instruments shall be NIST traceable with an accuracy as specified in 40 CFR §1066.501 subparagraph (a)(iv) ~~[February 19, 2015]~~ ~~and accurate to ±1% of the maximum value of the variable (AC/DC volts and amps) being measured.~~ Suggested equipment: ~~amp meter/power meter capable of sampling voltage and current.~~ Instruments measuring voltage and current shall be as specified in 40 CFR §1066.501 subparagraph (a)(iv)(4) ~~[February 19, 2015]~~ sampled at a minimum rate of 20 hz.

* * * *

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 one or more than one driver-selectable modes (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.

To be conducted pursuant to 40 CFR §1066.801 ~~[April 28, 2104]~~ with the following revisions:

* * * *

6.12 Urban Vehicle Preconditioning for All Hybrid Electric Vehicles, Except Hybrid Fuel Cell Vehicles and Off-Vehicle Charge Capable Hybrid Electric Vehicles.

* * * *

~~6.12.54 Within five minutes of~~After completing the preconditioning drive, ~~battery initial state-of-charge shall~~ may be set by driving an additional UDDS cycles distance on the chassis dynamometer such that the SOC Criterion is satisfied by applying the ±1% SOC Net Energy Change Tolerances in section F.9. However, if the alternative End-of-Test Criterion in section F.6.3.18 is used, then setting initial SOC shall not be permitted due to the larger ±5% SOC Net Energy Change Tolerance provided by the alternative End-of-Test Criterion in section F.6.3.18. ~~The battery state of charge may be set by driving additional UDDS cycles, at a level that satisfies one of the following conditions:~~

* * * *

6.2.6 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~~ Initial SOC may be set during the soak period by discharging or charging the battery such that the SOC Criterion is satisfied when applying the ±1% SOC Net Energy Change Tolerances in section F.9. However, if the alternative End-of-Test Criterion in section F.6.3.18 is used, then setting initial SOC shall not be permitted due to the larger ±5% SOC Net Energy Change Tolerance provided by the alternative End-of-Test criterion in section F.6.3.18.

* * * *

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 a hot-start test UDDS cycle as described in section F.6.1.3. If driver-selectable modes are available, activate the driver-selectable mode to be tested for the Urban Emission Test to determine worst case emissions as described in the introductory paragraphs of section F.6. 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 (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) [April 28, 2014], 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) [April 28, 2014]. 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).~~

* * * *

6.3.17 Amend subparagraph (3): **End-of-Test Criteria.** ~~A valid test shall satisfy the SOC Net Energy Change Tolerances in section F.9. For HEVs that use a battery as an energy storage device, (Amp-hr_{initial}) is the stored charge at the beginning of the cold-start UDDS cycle, and (Amp-hr_{final}) is the stored battery charge at the end of the subsequent hot-start UDDS cycle. The final stored battery charge, (Amp-hr_{final}), shall not exceed either (Amp-hr_{final})_{max} or (Amp-hr_{final})_{min} for a valid test.~~

For HEVs that use a capacitor as an energy storage device, $(V_{initial}^2)$ is the square of the capacitor voltage stored at the beginning of the cold-start UDDS cycle, and (V_{final}) is the stored capacitor voltage at the end of the subsequent hot-start UDDS cycle. The final stored capacitor voltage, (V_{final}) , shall not exceed either $(V_{final})_{max}$ or $(V_{final})_{min}$ for a valid test. For HEVs that use an electro-mechanical flywheel as an energy storage device, $(rpm_{initial}^2)$ is the squared flywheel rotational speed at the beginning of the cold-start UDDS cycle, and (rpm_{final}) is the flywheel rotational speed at the end of the subsequent hot-start UDDS cycle. The final flywheel rotational speed, (rpm_{final}) , shall not exceed either $(rpm_{final})_{max}$ or $(rpm_{final})_{min}$ for a valid test.

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 of $\pm 5\%$ SOC Net Energy Change Tolerance in Appendix C of SAE J1711 ~~pursuant to 40 CFR §1066.504~~ may be used to validate an Urban Emission Test with approval from the Executive Officer. Appendix C of SAE J1711 may not be used to correct measured values for any emissions. ~~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 $\pm 5\%$ 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 $\pm 1\%$ SOC Net Energy Change Tolerances in section F.9 are insufficient to validate testing. If the alternative End-of-Test criteria of $\pm 5\%$ 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 $\pm 5\%$ 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).~~

* * * *

7. Highway Emission Test Provisions 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 §1066.801 ~~[April 28, 2014]~~, §600.111-08 ~~[December 27, 2006]~~ with the following revisions except as noted.

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

For vehicles with one or more ~~than one~~ driver-selectable modes (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:

* * * *

7.1.2 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. End-of-Test Criterion: A valid test shall satisfy the SOC Net Energy Change Tolerances in section F.9 for the HFEDS cycle with emission sampling. For HEVs that use a battery as an energy storage device, (Amp-hr_{initial}) is the stored charge at the beginning of the HFEDS cycle with emission sampling, and (Amp-hr_{final}) is the stored battery charge at the end of the same HFEDS cycle with emission sampling. The final stored battery charge, (Amp-hr_{final}), shall not exceed either (Amp-hr_{final})_{max} or (Amp-hr_{final})_{min} for a valid test. For HEVs

that use a capacitor as an energy storage device, (V_{initial}^2) is the square of the capacitor voltage stored at the beginning of the same HFEDS cycle with emission sampling, and (V_{final}) is the stored capacitor voltage at the end of the HFEDS cycle with emission sampling. The final stored capacitor voltage, (V_{final}) , shall not exceed either $(V_{\text{final}})_{\text{max}}$ or $(V_{\text{final}})_{\text{min}}$ for a valid test. For HEVs that use an electro-mechanical flywheel as an energy storage device, $(\text{rpm}_{\text{initial}}^2)$ is the squared flywheel rotational speed at the beginning of the HFEDS cycle with emission sampling, and $(\text{rpm}_{\text{final}})$ is the flywheel rotational speed at the end of the same HFEDS cycle with emission sampling. The final flywheel rotational speed, $(\text{rpm}_{\text{final}})$, shall not exceed either $(\text{rpm}_{\text{final}})_{\text{max}}$ or $(\text{rpm}_{\text{final}})_{\text{min}}$ for a valid test.

7.1.3 Amend subparagraph (c): Turn the vehicle off at the end of the HFEDS cycle and stop all sampling and recording, including background. Stop any integrating devices and indicate the end of the test cycle in the recorded data.

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.7.1.32, then the alternative End-of-Test criterion of $\pm 5\%$ SOC Net Energy Change Tolerance in Appendix C of SAE J1711 pursuant to 40 CFR §1066.501 may be used to validate a Highway Emission Test with approval from the Executive Officer. Appendix C of SAE J1711 may not be used to correct measured values for any emissions 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 $\pm 5\%$ 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 $\pm 1\%$ SOC Net Energy Change Tolerances in section F.9 are insufficient to validate testing. If the alternative End of Test criteria of $\pm 5\%$ 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 $\pm 5\%$ 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 one or more ~~than one~~ driver-selectable modes (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 as noted.

* * * *

8.21 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:

* * * *

8.1.10 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. End-of-Test Criterion: A valid test shall satisfy the SOC Net Energy Change Tolerances in section F.9 for the US06 cycle with emission sampling. For HEVs that use a battery as an energy storage device, (Amp-hr_{initial}) is the stored charge at the beginning of the US06 cycle with emission sampling, and (Amp-hr_{final}) is the stored battery charge at the end of the same US06 cycle with emission sampling. The final stored battery charge, (Amp-hr_{final}), shall not exceed either (Amp-hr_{final})_{max} or (Amp-hr_{final})_{min} for a valid test. For HEVs that use a capacitor as an energy storage device, (V²_{initial}) is the square of the capacitor voltage stored at the beginning of the US06 cycle with emission sampling, and (V_{final}) is the stored capacitor voltage at the end of the US06 cycle with emission sampling. The final stored capacitor voltage, (V_{final}), shall not

exceed either $(V_{final})_{max}$ or $(V_{final})_{min}$ for a valid test. For HEVs that use an electro-mechanical flywheel as an energy storage device, $(rpm^2_{initial})$ is the squared flywheel rotational speed at the beginning of the US06 cycle with emission sampling, and (rpm_{final}) is the flywheel rotational speed at the end of the US06 cycle with emission sampling. The final flywheel rotational speed, (rpm_{final}) , shall not exceed either $(rpm_{final})_{max}$ or $(rpm_{final})_{min}$ for a valid test.

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 of $\pm 5\%$ SOC Net Energy Change Tolerance in Appendix C of SAE J1711 ~~pursuant to 40 CFR §1066.504~~ may be used to validate a US06 Emission Test with approval from the Executive Officer. Appendix C of SAE J1711 may not be used to correct measured values for any emissions. ~~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 $\pm 5\%$ 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 $\pm 1\%$ SOC Net Energy Change Tolerances in section F.9 are insufficient to validate testing. If the alternative End-of-Test criteria of $\pm 5\%$ 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 $\pm 5\%$ 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 CO₂ 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).~~

* * * *

8.48.2 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:

8.2.3 Subparagraphs (c)(6) through (d)(4). [No change.]

8.2.4 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.

~~8.2.45~~ Amend subparagraph (d)(2): ~~A valid test shall satisfy the SOC Net Energy Change Tolerances in section F.9 for the SC03 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 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. End-of-Test Criterion: A valid test shall satisfy the SOC Net Energy Change Tolerances in section G.10 for the SC03 cycle with emission sampling. For HEVs that use a battery as an energy storage device, $(\text{Amp}\cdot\text{hr})_{\text{initial}}$ is the stored charge at the beginning of the SC03 cycle with emission sampling, and $(\text{Amp}\cdot\text{hr})_{\text{final}}$ is the stored battery charge at the end of the SC03 cycle with emission sampling. The final stored battery charge, $(\text{Amp}\cdot\text{hr})_{\text{final}}$, shall not exceed either $(\text{Amp}\cdot\text{hr})_{\text{final}\text{max}}$ or $(\text{Amp}\cdot\text{hr})_{\text{final}\text{min}}$ for a valid test. For HEVs that use a capacitor as an energy storage device, $(V^2)_{\text{initial}}$ is the square of the capacitor voltage stored at the beginning of the SC03 cycle with emission sampling, and $(V)_{\text{final}}$ is the stored capacitor voltage at the end of the SC03 cycle with emission sampling. The final stored capacitor voltage, $(V)_{\text{final}}$, shall not exceed either $(V)_{\text{final}\text{max}}$ or $(V)_{\text{final}\text{min}}$ for a valid test. For HEVs that use an electro-mechanical flywheel as an energy storage device, $(\text{rpm}^2)_{\text{initial}}$ is the squared flywheel rotational speed at the beginning of the SC03 cycle with emission sampling, and $(\text{rpm})_{\text{final}}$ is the flywheel rotational speed at the end of the SC03 cycle with emission sampling. The final flywheel rotational speed, $(\text{rpm})_{\text{final}}$, shall not exceed either $(\text{rpm})_{\text{final}\text{max}}$ or $(\text{rpm})_{\text{final}\text{min}}$ for a valid test.

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

~~8.2.67~~ **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 of $\pm 5\%$ SOC Net Energy Change Tolerance in Appendix C of SAE J1711 ~~pursuant to 40 CFR §1066.504~~ may be used to validate an SC03 Emission Test with approval from the Executive Officer. Appendix C of SAE J1711 may not be used to correct measured values for any emissions. ~~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 SO₃ 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 CO₂ 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).~~

* * * *

9. State-of-Charge Net Energy Change Tolerances for All Hybrid Electric Vehicles, Except Hybrid Fuel Cell Vehicles and Off-Vehicle Charge Capable Hybrid Electric Vehicles.

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9.2 For hybrid electric vehicles that use a capacitor as an energy storage device, the following state-of-charge net energy change tolerance shall apply:

$$(V_{\text{final}})_{\text{max}} = \sqrt{V_{\text{initial}}^2 + 0.01 * \frac{(2 * NHV_{\text{fuel}} * m_{\text{fuel}})}{C}}$$

$$(V_{\text{final}})_{\text{min}} = \sqrt{V_{\text{initial}}^2 - 0.01 * \frac{(2 * NHV_{\text{fuel}} * m_{\text{fuel}})}{C}}$$

Where:

(V_{final})_{max} = The maximum stored capacitor voltage allowed at the end of the test

(V_{final})_{min} = The minimum stored capacitor voltage allowed at the end of the test

- $V_{initial}^2$ = The square of the capacitor voltage stored at the beginning of the test
- NHV_{fuel} = Net heating value of consumable fuel, in Joules/kg
- m_{fuel} = Total mass of fuel consumed during test, in kg
- C = Rated capacitance of the capacitor, in Farads

* * * *

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.

* * * *

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

* * * *

1. Electric Dynamometer.

All off-vehicle charge capable HEVs ~~must~~ ~~may~~ must be tested using an ~~48-inch single roll~~ electric dynamometer meeting the requirements of ~~40 CFR Subpart B, §86.108-00(b)(2) [October 22, 1996]~~ or 40 CFR Part 1066 Subpart C ~~[April 28, 2014]~~, as applicable.

* * * *

3. General Testing Requirements.

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3.3 **Measurement Accuracy.** The overall error in voltage and current recording instruments shall be NIST traceable with an accuracy as specified in 40 CFR §1066.501 subparagraph (a)(iv) [February 19, 2015] and accurate to $\pm 1\%$ of the maximum value of the variable (AC/DC volts and amps) being measured. Suggested equipment: amp meter/power meter capable of sampling voltage and current. Instruments measuring voltage and current shall be as specified in 40 CFR §1066.501 subparagraph (a)(iv)(4) [February 19, 2015] sampled at a minimum rate of 20 hz.

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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 the 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, NO_x, and PM from either the charge-depleting or charge-sustaining tests. The sum of urban NMOG + NO_x emissions ~~of the engine~~ shall constitute the worst case for the urban charge-sustaining or charge-depleting modes of operation.

Vehicles with ~~one or more than one~~ driver-selectable modes 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 + NO_x 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 NMOG + NO_x emissions of NMOG + NO_x 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 subsection 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.

For the Urban Charge-Depleting Emission Test in section G.5.4.2, confirmatory and in-use compliance testing shall use two hot-start UDDS cycles to ensure that the vehicle has achieved full warm-up conditions in accordance with section G.5.4.2.1. If, based on the last cycle or series of cycles, the Additional End-of-Test criteria in section G.5.4.3.1 are not satisfied at the end of the second hot-start, then a third hot-start

UDDS cycle shall be performed. If criteria are still not satisfied at the end of the third hot-start UDDS cycle, then additional hot-start UDDS cycles shall be performed until:

- (1) based on the last cycle or series of cycles, the Additional End-of-Test criteria in section G.5.4.3.1 are satisfied; or
- (2) the Additional End-of-Test criteria in section G.5.4.3.2 are satisfied.

For the Alternative Urban Charge-Depleting Emission Test, confirmatory and in-use compliance testing shall use one hot-start UDDS cycle as specified in section G.5.4.6.

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:

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5.42 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:

~~5.42.1 The vehicle shall be preconditioned in the driver selectable mode to be tested and in charge-sustaining operation with the vehicle in default mode or in normal mode if the vehicle does not have default mode. 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.~~

* * * *

~~5.42.75 For the Urban eCharge-Depleting range eEmission Test, and the Urban eCharge-Sustaining eEmission Test, the preconditioning cycle shall be the UDDS cycle and performed at this time. For the Urban Charge-Sustaining Emission~~

~~Test, except as noted in sections G.5.2.8.1, G.5.2.8.2, and G.5.2.8.3, the initial SOC may be set after the preconditioning cycle by driving an additional UDDS cycles distance on the chassis dynamometer such that the SOC Criterion is satisfied when applying the $\pm 1\%$ 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.~~

* * * *

~~5.42.408 For the uUrban eCharge-dDepleting range Emission tTest, the Alternative Urban Charge-Depleting Emission Test, the hHighway cCharge-dDepleting rRange tTest, and the optional cCold sStart US06 rRange tTest, charge the vehicle to full state-of-charge as specified by the vehicle manufacturer. For the Urban Charge-Sustaining Emission Test, except as noted in sections G.5.2.8.1, G.5.2.8.2, and G.5.2.8.3, 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 $\pm 1\%$ 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.5.4.25 (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.5.4.25 (iv). The vehicle must be turned off during charging and charge time shall not exceed soak time.~~

~~5.2.8.1 If the alternative End-of-Test Criterion in section G.5.3.18 is used, then initial SOC setting shall not be permitted after the preconditioning cycle nor during the soak period prior to the Urban Charge-Sustaining Emission Test.~~

~~5.2.8.2 If testing a vehicle in a charge-increasing driver-selectable mode, then initial SOC setting shall not be permitted after the preconditioning cycle nor during the soak period prior to the Urban Charge-Sustaining Emission Test.~~

~~5.2.8.3 If testing a vehicle in charge-increasing operation, 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.

* * * *

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 a 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 to determine worst case emissions as described in the introductory paragraphs of section G.5. If a vehicle has a driver-selectable, charge-increasing mode, SOC shall be set in accordance with section G.5.4.5(iv) with the charge-increasing mode activated at the start of the cold-start UDDS cycle. 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) [April 28, 2014], except as specified in paragraph (b)(5) of 40 CFR §1066.815 [February 19, 2015]. 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) [April 28, 2014]. 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).

* * * *

5.3.10 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 in the driver-selectable mode to be tested following the 12 to 36 hour soak period.

* * * *

5.3.13 Subparagraph (d)(2). [No change.]

5.3.14 Amend subparagraph (d)(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.

5.3.15 Amend subparagraph (d)(2)(ii): Repeat the steps in paragraph (d)(1)(ii) of this section.

5.3.16 Amend subparagraph (d)(2)(iii): For bag 4 measurement or single bag per UDDS cycle measurement, operate the vehicle over the remainder of the UDDS and conclude the testing as described in paragraphs (d)(1)(iii) and (iv) of this section.

5.3.17 Amend subparagraph (d)(3): **End-of-Test Criteria**. A valid test shall satisfy the SOC Net Energy Change Tolerances in section G.10. For PHEVs that use a battery as an energy storage device, $(\text{Amp-hr}_{\text{initial}})$ is the stored charge at the beginning of the cold-start UDDS cycle, and $(\text{Amp-hr}_{\text{final}})$ is the stored battery charge at the end of the subsequent hot-start UDDS cycle. The final stored battery charge, $(\text{Amp-hr}_{\text{final}})$, shall not exceed either $(\text{Amp-hr}_{\text{final}})_{\text{max}}$ or $(\text{Amp-hr}_{\text{final}})_{\text{min}}$ for a valid test. For PHEVs that use a capacitor as an energy storage device, (V^2_{initial}) is the square of the capacitor voltage stored at the beginning of the cold-start UDDS cycle, and (V_{final}) is the stored capacitor voltage at the end of the subsequent hot-start UDDS cycle. The final stored capacitor voltage, (V_{final}) , shall not exceed either $(V_{\text{final}})_{\text{max}}$ or $(V_{\text{final}})_{\text{min}}$ for a valid test. For PHEVs that use an electro-mechanical flywheel as an energy storage device, $(\text{rpm}^2_{\text{initial}})$ is the squared flywheel rotational speed at the beginning of the cold-start UDDS cycle, and $(\text{rpm}_{\text{final}})$ is the flywheel rotational speed at the end of the subsequent hot-start UDDS cycle. The final flywheel rotational speed, $(\text{rpm}_{\text{final}})$, shall not exceed either $(\text{rpm}_{\text{final}})_{\text{max}}$ or $(\text{rpm}_{\text{final}})_{\text{min}}$ for a valid test. ~~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 Criteria~~on~~. With approval from the Executive Officer, if the SOC Net Energy Change Tolerance is not satisfied after the hot-start UDDS cycle in section G.5.3.17, an Urban Charge-Sustaining Emission Test may be considered valid if: ~~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). The alternative End-of-Test criterion of $\pm 5\%$ SOC Net Energy Change Tolerance in Appendix C of SAE J1711 is satisfied (Note: Appendix C of SAE J1711 may not be used to correct measured values for any emissions.); or

5.3.18.2 Amend subparagraph (a)(2)(ii): The alternative End of Test criterion of $\pm 5\%$ 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 $\pm 1\%$ SOC Net Energy Change Tolerances in section G.10 are insufficient to validate testing. If the alternative End of Test criteria of $\pm 5\%$ 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 $\pm 5\%$ SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010). The SOC at the end of the hot-start UDDS cycle is higher than the SOC at the beginning of the cold-start UDDS cycle.

5.3.18.3 Amend subparagraph (a)(2)(iii): Appendix C of SAE J1711 (June 2010) may be used to correct CO₂ 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 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. Record the SOC when the engine first starts. 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.

5.4.1.1 Urban Equivalent All-Electric Range shall be calculated in accordance with section G.11.

5.4.2 Urban Charge-Depleting Range Emission Test.

* * * *

To be conducted pursuant to 40 CFR §1066.815 ~~[April 28, 2104]~~ with the following revisions:

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 to determine worst case emissions as described in the introductory paragraphs of section G.5. 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~~ shall be measured for all test cycles when the ~~auxiliary power unit~~ engine is operating. For each test cycle ~~for during which emissions were not measured~~ generated, emissions are not required to be sampled. However, the manufacturer must validate that the ~~auxiliary power unit~~ engine 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 such that the vehicle does not achieve full warm-up conditions prior to ~~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 $\Sigma m_{PM-hUDDS}$ 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) [April 28, 2014], 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) [April 28, 2014]. 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).

* * * *

5.4.2.10 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 in the appropriate driver-selectable mode to be tested following the 12 to 36 hour soak period.

* * * *

5.4.2.13 Subparagraph (d)(2). [No change.]

5.4.2.14 Amend subparagraph (d)(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.

5.4.2.15 Amend subparagraph (d)(2)(ii): Repeat the steps in paragraph (d)(1)(ii) of this section.

5.4.2.16 Amend subparagraph (d)(2)(iii): For bag 4 measurement or single bag per UDDS cycle measurement, operate the vehicle over the remainder of the UDDS and conclude the testing as described in subparagraphs (d)(1)(iii) and (iv) of this section.

5.4.2.17 Amend subparagraph (d)(3): End-of-Test Criteria... A valid test shall satisfy the SOC Net Energy Change Tolerances in section G.10. For PHEVs that use a battery as an energy storage device, $(\text{Amp-hr}_{\text{initial}})$ is the stored charge at the beginning of the cold-start UDDS cycle, and $(\text{Amp-hr}_{\text{final}})$ is the stored battery charge at the end of the next hot-start UDDS cycle immediately following the cold-start UDDS cycle. The final stored battery charge, $(\text{Amp-hr}_{\text{final}})$, shall not exceed either $(\text{Amp-hr}_{\text{final}})_{\text{max}}$ or $(\text{Amp-hr}_{\text{final}})_{\text{min}}$ for a valid test. For PHEVs that use a capacitor as an energy storage device, (V^2_{initial}) is the square of the capacitor voltage stored at the beginning of the cold-start UDDS

cycle, and (V_{final}) is the stored capacitor voltage at the end of the next hot-start UDDS cycle immediately following the cold-start UDDS cycle. The final stored capacitor voltage, (V_{final}) , shall not exceed either $(V_{final})_{max}$ or $(V_{final})_{min}$ for a valid test. For PHEVs that use an electro-mechanical flywheel as an energy storage device, $(rpm_{initial})^2$ is the squared flywheel rotational speed at the beginning of the cold-start UDDS cycle, and (rpm_{final}) is the flywheel rotational speed at the end of the next hot-start UDDS cycle immediately following the cold-start UDDS cycle. The final flywheel rotational speed, (rpm_{final}) , shall not exceed either $(rpm_{final})_{max}$ or $(rpm_{final})_{min}$ for a valid test. ~~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. With approval from the Executive Officer, ~~if the SOC Net Energy Change Tolerance is not satisfied after the hot-start test~~UDDS cycle in section G.5.4.2.17, an Urban Charge-Depleting Emission Test may be considered valid if: ~~then the alternative End-of-Test criteria pursuant to 40 CFR §1066.501 may be used to validate testing with the following revisions:~~

~~5.4.3.1 Delete subparagraphs (a)(1) through (a)(2)(i):~~ The alternative End-of-Test criteria in Section 3.9 or Section 3.9.1 of SAE J1711 are satisfied; or

~~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 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 Not 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).~~ The SOC at the end of the hot-start UDDS cycle is higher than the SOC at the beginning of the cold-start UDDS cycle.

~~5.4.3.3 Amend subparagraph (a)(2)(iii):~~ ~~Appendix C of SAE J1711 (June 2010) may be used to correct CO₂ emissions, and carbon related~~

~~exhaust emissions, but may not be used to correct measured values for criteria pollutant emissions.~~

~~5.4.3.43 Delete subparagraphs (a)(2)(iv)(iii) through (e).~~

* * * *

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~~ and 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.

* * * *

(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 when driving in default mode or in normal mode if the vehicle does not have default mode. If testing a vehicle in driver-selectable, charge-increasing mode: first set SOC in accordance with the conditions set forth in the first two sentences of this section G.5.4.5(iv) with the vehicle in default mode or in normal mode if the vehicle does not have default mode, then activate the charge-increasing mode at the start of the cold-start UDDS cycle. For all tests, ~~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.~~

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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:

* * * *

5.6.2 Urban Charge-Sustaining Particulate Emissions Calculations.

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

* * * *

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

To be conducted pursuant to 40 CFR §1066.801 ~~[April 28, 2014]~~, except as noted.

Alternative procedures may be used 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 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 ~~one or more than one~~ driver-selectable modes 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.

* * * *

6.31 Determination of Highway All-Electric Range, and Highway Equivalent All-Electric Range, and Highway Emissions for Off-Vehicle Charge Capable Hybrid Electric Vehicles.

6.31.1 The **Highway All-Electric Range** shall be defined as the distance that the vehicle is driven from the start of the Highway Charge-Depleting Range Test until the ~~internal combustion engine~~ first starts. The Highway Charge-Depleting Range Test is performed with the vehicle initially at full state-of-charge and in default mode or in normal mode if the vehicle does not have a default mode.

6.31.2 Highway Charge-Depleting Range Test.

(i) ~~Vehicle preconditioning.~~ The vehicle shall be preconditioned pursuant to section G.6.1.

(ii) **Dynamometer run.** ~~At the end of the cold soak period, Starting at full state-of-charge,~~ the vehicle shall be placed or pushed, onto a dynamometer and operated through the Continuous Highway Test Schedule until the ~~State-of-Charge SOC Net Energy Change Tolerances (specified in section G.10 of these test procedures) that indicate charge-sustaining operation are is met for one HFEDS cycle.~~ Additional End-of-Test Criteria as provided for in the Urban Charge-Depleting Emission Test in sections G.5.4.3.1 and G.5.4.3.2 may be used for the Highway Charge-Depleting Range Test with approval from the Executive Officer. The Alternative Continuous Highway Test Schedule may be substituted for the Continuous Highway Test Schedule if the test facility is unable to perform the Continuous Highway Test Schedule. ~~Refer to section G.11, for calculations of highway exhaust 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. Emissions shall be measured for all test~~

cycles when the engine is operating. For each test cycle during which emissions are not generated, emissions are not required to be sampled. However, the manufacturer must validate that the engine did not turn on at any time during the test cycle.

* * * *

6.1.3 **Equivalent All-Electric Range** shall be calculated in accordance with section G.11.

6.3.31.4 **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, do not activate the driver-selectable mode to be tested shall be activated during for the UDDS preconditioning drive, but set the vehicle in default mode or normal mode 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, 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, 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. End-of-Test Criterion: A valid test shall satisfy the SOC Net Energy Change Tolerances in section F-9G.10 for the HFEDS cycle with emission sampling. For PHEVs that use a battery as an energy storage device, $(\text{Amp-hr}_{\text{initial}})$ is the stored charge at the beginning of the HFEDS cycle with emission sampling, and $(\text{Amp-hr}_{\text{final}})$ is the stored battery charge at the end of the same HFEDS cycle with emission sampling. The final stored battery charge, $(\text{Amp-hr}_{\text{final}})$, shall not exceed either $(\text{Amp-hr}_{\text{final}})_{\text{max}}$ or $(\text{Amp-hr}_{\text{final}})_{\text{min}}$ for a valid test. For PHEVs that use a capacitor as an energy storage device, (V_{initial}^2) is the square of the capacitor voltage stored at the beginning of the HFEDS cycle with emission sampling, and (V_{final}) is the stored capacitor voltage at the end of the same HFEDS cycle with emission sampling. The final stored capacitor voltage, (V_{final}) , shall not exceed either $(V_{\text{final}})_{\text{max}}$ or $(V_{\text{final}})_{\text{min}}$ for a valid test. For PHEVs that use an electro-mechanical flywheel as an energy storage device, $(\text{rpm}^2_{\text{initial}})$ is the squared flywheel rotational speed at the beginning of the HFEDS cycle with emission sampling, and $(\text{rpm}_{\text{final}})$ is the flywheel rotational speed at the end of the same HFEDS cycle with emission sampling. The final flywheel rotational speed, $(\text{rpm}_{\text{final}})$, shall not exceed either $(\text{rpm}_{\text{final}})_{\text{max}}$ or $(\text{rpm}_{\text{final}})_{\text{min}}$ for a valid test. ~~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.~~

6.1.4.3 Amend subparagraph (c): Turn the vehicle off at the end of the final HFEDS cycle and stop all sampling and recording, including background. Stop any integrating devices and indicate the end of the test cycle in the recorded data.

6.1.5 Additional End-of-Test Criterion. With approval from the Executive Officer, ~~if the SOC Net Energy Change Tolerance is not satisfied after the hot start test~~ for the HFEDS cycle with emission sampling in section ~~C-6.4.1-2G.6.1.4.2~~, a Highway Emission Test may be considered valid if: ~~then the alternative End-of-Test criterion pursuant to 40 CFR §1066.501 may be used with the following revisions:~~

~~6.1.5.1 Delete subparagraphs (a)(1) through (a)(2)(i): The alternative End-of-Test criterion of $\pm 5\%$ SOC Net Energy Change Tolerance in Appendix C of SAE J1711 is satisfied (Note: Appendix C of SAE J1711 may not be used to correct measured values for any emissions.); or~~

~~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 $\pm 5\%$ 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 $\pm 1\%$ 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 $\pm 5\%$ 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 $\pm 5\%$ SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010). 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.~~

~~6.1.5.3 Amend subparagraph (a)(2)(iii): Appendix C of SAE J1711 (June 2010) may be used to correct CO₂ emissions, and carbon-related exhaust emissions, but may not be used to correct measured values for criteria pollutant emissions.~~

~~6.1.5.4 Delete subparagraphs (a)(2)(iv) through (c).~~

* * * *

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 one or more ~~than one~~ driver-selectable modes 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 NMOG + NOx 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.

* * * *

7.21 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.~~

* * * *

7.1.12 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. End-of-Test Criterion: A valid test shall satisfy the SOC Net Energy Change Tolerances in section G.10 for the US06 cycle with emission sampling. For PHEVs that use a battery as an energy storage device, (Amp-hr_{initial}) is the stored charge at the beginning of the US06 cycle with emission sampling, and (Amp-hr_{final}) is the stored battery charge at the end of the same US06 cycle with emission sampling. The final stored battery charge, (Amp-hr_{final}), shall not exceed either (Amp-hr_{final})_{max} or (Amp-

$hr_{(final)min}$ for a valid test. For PHEVs that use a capacitor as an energy storage device, $(V_{initial}^2)$ is the square of the capacitor voltage stored at the beginning of the US06 cycle with emission sampling, and (V_{final}) is the stored capacitor voltage at the end of the same US06 cycle with emission sampling. The final stored capacitor voltage, (V_{final}) , shall not exceed either $(V_{final})_{max}$ or $(V_{final})_{min}$ for a valid test. For PHEVs that use an electro-mechanical flywheel as an energy storage device, $(rpm_{initial}^2)$ is the squared flywheel rotational speed at the beginning of the US06 cycle with emission sampling, and (rpm_{final}) is the flywheel rotational speed at the end of the same US06 cycle with emission sampling. The final flywheel rotational speed, (rpm_{final}) , shall not exceed either $(rpm_{final})_{max}$ or $(rpm_{final})_{min}$ for a valid test. ~~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. With approval from the Executive Officer, ~~if the SOC Net Energy Change Tolerance is not satisfied for the US06 cycle with emission sampling in section G.7.1.40.12, a US06 Emission Test may be considered valid if:~~ 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).~~ The alternative End-of-Test criterion of $\pm 5\%$ SOC Net Energy Change Tolerance in Appendix C of SAE J1711 is satisfied (Note: Appendix C of SAE J1711 may not be used to correct measured values for any emissions.); or

7.1.14.2 ~~Amend subparagraph (a)(2)(ii): The alternative End-of-Test criterion of $\pm 5\%$ 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 $\pm 1\%$ SOC Net Energy Change Tolerances in section G.10 are insufficient to validate testing. If the alternative End-of-Test criteria of $\pm 5\%$ 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 $\pm 5\%$ SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010).~~ 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.

~~7.1.14.3 Amend subparagraph (a)(2)(iii): Appendix G of SAE J1711 (June 2010) may be used to correct CO₂ 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).~~

* * * *

7.47.2 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.~~

* * * *

7.2.45 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. End-of-Test Criterion: A valid test shall satisfy the SOC Net Energy Change Tolerances in section G.10 for the SC03 cycle with emission sampling. For PHEVs that use a battery as an energy storage device, (Amp-hr_{initial}) is the stored charge at the beginning of the SC03 cycle with emission sampling, and (Amp-hr_{final}) is the stored battery charge at the end of the same SC03 cycle with emission sampling. The final stored battery charge, (Amp-hr_{final}), shall not exceed either (Amp-hr_{final})_{max} or (Amp-hr_{final})_{min} for a valid test. For PHEVs that use a capacitor as an energy storage device, (V²_{initial}) is the square of the capacitor voltage stored at the beginning of the SC03 cycle with emission sampling, and (V_{final}) is the stored capacitor voltage at the end of the same SC03 cycle with emission sampling. The final stored capacitor voltage, (V_{final}), shall not exceed either (V_{final})_{max} or (V_{final})_{min} for a valid test. For PHEVs that use an electro-mechanical flywheel as an energy storage device, (rpm²_{initial}) is the squared flywheel rotational speed at the beginning of the SC03 cycle with emission sampling, and (rpm_{final}) is the flywheel rotational speed at the end of the same SC03 cycle with emission sampling. The final flywheel rotational speed, (rpm_{final}), shall not exceed either (rpm_{final})_{max} or (rpm_{final})_{min} for a valid test. ~~Am~~

~~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. ~~With approval from the Executive Officer, if the SOC Net Energy Change Tolerance is not satisfied for the SC03 cycle with emission sampling in section G.7.2.4.5, an SC03 Emission Test may be considered valid if: 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). The alternative End-of-Test criterion of $\pm 5\%$ SOC Net Energy Change Tolerance in Appendix C of SAE J1711 is satisfied (Note: Appendix C of SAE J1711 may not be used to correct measured values for any emissions.); or~~

~~7.2.7.2 Amend subparagraph (a)(2)(ii): The alternative End of Test criterion of $\pm 5\%$ 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 $\pm 1\%$ SOC Net Energy Change Tolerances in section G.10 are insufficient to validate testing. If the alternative End-of-Test criteria of $\pm 5\%$ 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 $\pm 5\%$ SOC Net Energy Change Tolerance in Appendix C of SAE J1711 (June 2010). 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.~~

~~7.2.7.3 Amend subparagraph (a)(2)(iii): Appendix C of SAE J1711 (June 2010) may be used to correct CO₂ 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).~~

* * * *

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

50°F testing shall be conducted pursuant to section G.5 with the modifications in Part II, Section GD of the “California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures for 2004 and 2017 and Subsequent Model Year 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 G.5 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. ~~and shall include the temperature provisions in 40 CFR Part 86 Subpart C – Emission Regulations for 1994 and Later Model Year Gasoline-Fueled New Light-Duty Vehicles, New Light-Duty Trucks and New Medium-Duty Passenger Vehicles; Cold Temperature Test Procedures.~~

* * * *

10. State-of-Charge Net Energy Change Tolerances for Off-Vehicle Charge Capable Hybrid Electric Vehicles.

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:

$$(\text{Amp-hr}_{\text{final}})_{\text{max}} = (\text{Amp-hr}_{\text{initial}}) + 0.01 * \left(\frac{NHV_{\text{fuel}} * m_{\text{fuel}}}{V_{\text{system}} * K_1} \right)$$

$$(\text{Amp-hr}_{\text{final}})_{\text{min}} = (\text{Amp-hr}_{\text{initial}}) - 0.01 * \left(\frac{NHV_{\text{fuel}} * m_{\text{fuel}}}{V_{\text{system}} * K_1} \right)$$

Where:

- (Amp-hr_{final})_{max} = Maximum allowed Amp-hr stored in battery at the end of the test
- (Amp-hr_{final})_{min} = Minimum allowed Amp-hr stored in battery at the end of the test

- (Amp-hr)_{initial} = Battery Amp-hr stored at the beginning of the test
- NHV_{fuel} = Net heating value of consumable fuel, in Joules/kg
- m_{fuel} = Total mass of fuel consumed during test, in kg
- K₁ = Conversion factor, 3600 seconds/hour
- V_{system} = Open circuit voltage (OCV) that corresponds to the SOC of the target SOC during charge-sustaining operation. This value shall be submitted for testing purposes, and it shall be subject to confirmation by the Air Resources Board.

~~An alternate state of charge net 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~~:

$$(V_{\text{final}})_{\text{max}} = \sqrt{V_{\text{initial}}^2 + 0.01 * \frac{(2 * NHV_{\text{fuel}} * m_{\text{fuel}})}{C}}$$

$$(V_{\text{final}})_{\text{min}} = \sqrt{V_{\text{initial}}^2 - 0.01 * \frac{(2 * NHV_{\text{fuel}} * m_{\text{fuel}})}{C}}$$

Where:

- (V_{final})_{max} = The maximum stored capacitor voltage allowed at the end of the test
- (V_{final})_{min} = The minimum stored capacitor voltage allowed at the end of the test
- V_{initial}² = The square of the capacitor voltage stored at the beginning of the test
- NHV_{fuel} = Net heating value of consumable fuel, in Joules/kg
- m_{fuel} = Total mass of fuel consumed during test, in kg
- C = Rated capacitance of the capacitor, in Farads

* * * *

12. The Calculations of the Combined Green-House Gas Regulatory Rating of Off-vehicle Charge Capable Hybrid Electric Vehicles

* * * *

I. Examples of Off-Vehicle Charge Capable Hybrid Electric Vehicle Terminology.

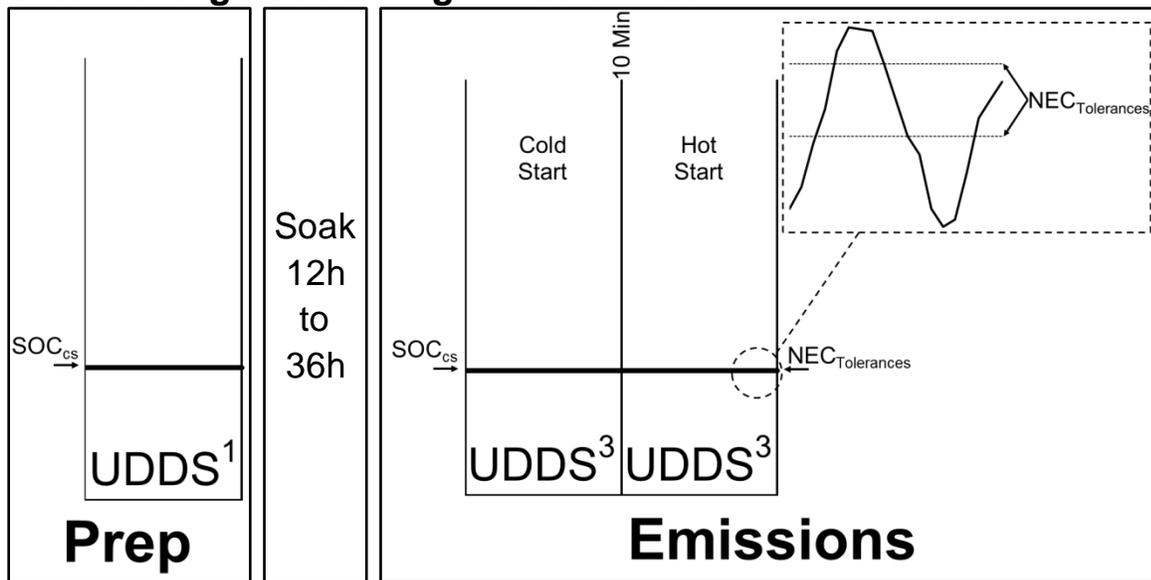
The figures in this section I are for illustrative purposes only. If any discrepancies exist between the language in the proceeding sections A through H and the figures in this section I, the requirements in sections A through H shall apply. The acronym “NEC” as used in this section I means “Net Energy Change.”

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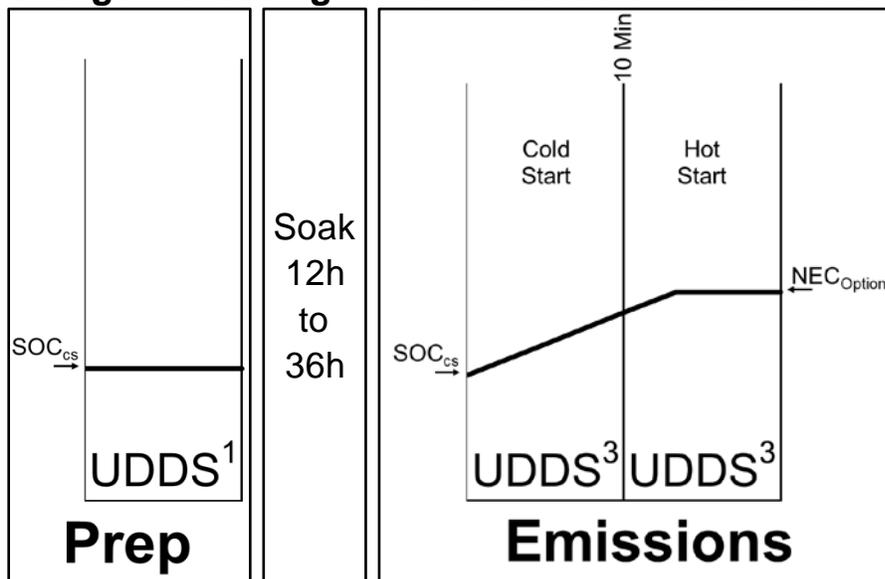
Note: The following Figures 3 – 9 are being added in connection with this second “15-Day Notice.” Since these are pictures, the addition of these figures cannot be shown in dotted underline to indicate additions.

* * * *

Urban Charge-Sustaining Emission Test



Urban Charge-Sustaining Emission Test with Charge-Increasing Driver-Selectable Mode Activated



¹ Emission sampling not required

² Emission sampling optional

³ Emission sampling required

SOC_{cs} : State-of-Charge at charge-sustaining level

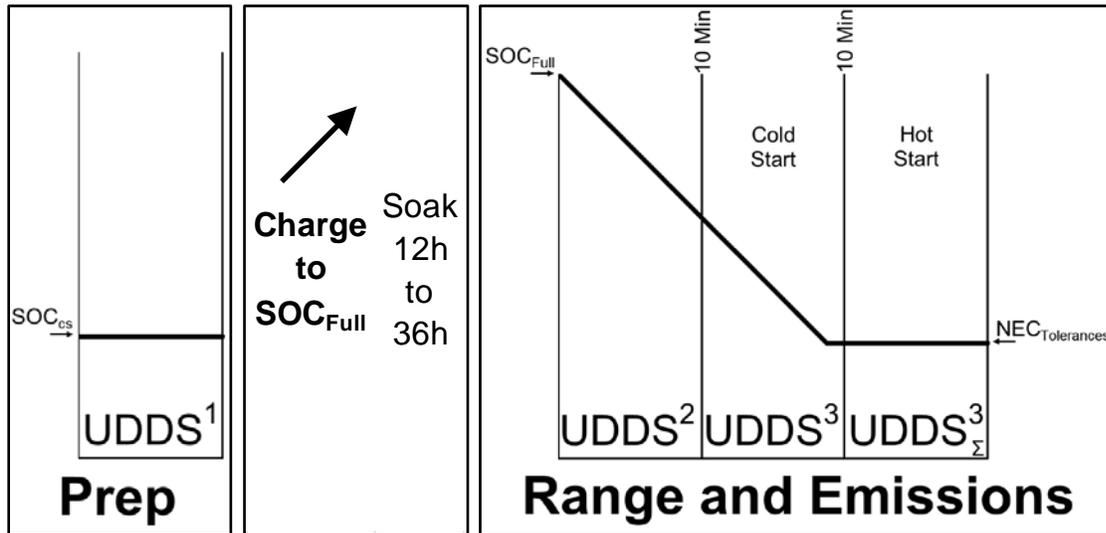
$NEC_{Tolerances}$: Net Energy Change Tolerances required

NEC_{Option} : NEC Tolerances apply; however, option available to validate test when SOC final > SOC initial.

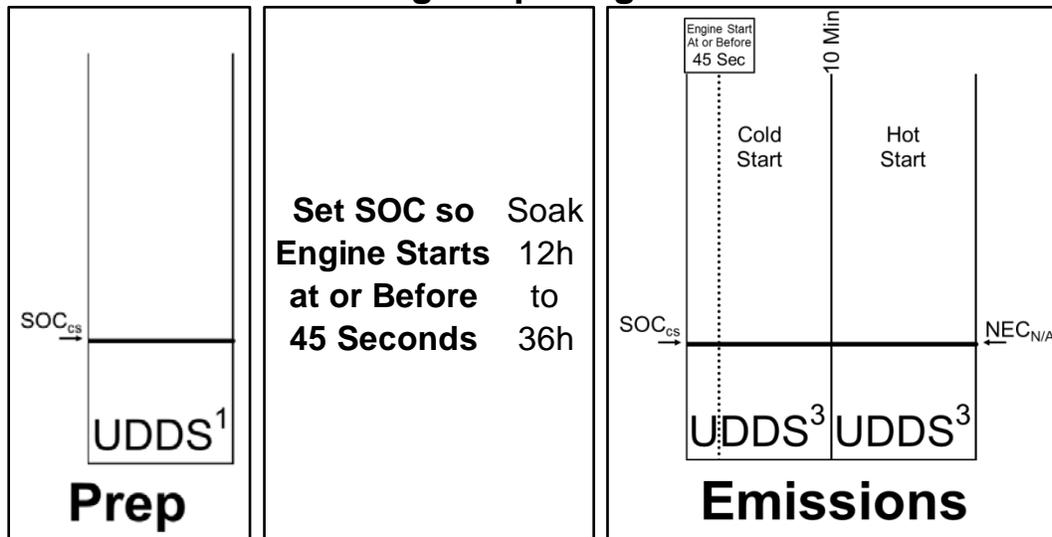
Figure 3

A-72

Urban Charge-Depleting Emission Test with Urban AER and EAER



Alternative Urban Charge-Depleting Emission Test



¹ Emission sampling not required

² Emission sampling optional

³ Emission sampling required

UDDS_Σ: Multiple Hot Start UDDS cycles may be required to satisfy NEC Tolerances

SOC_{cs}: State-of-Charge at charge-sustaining level

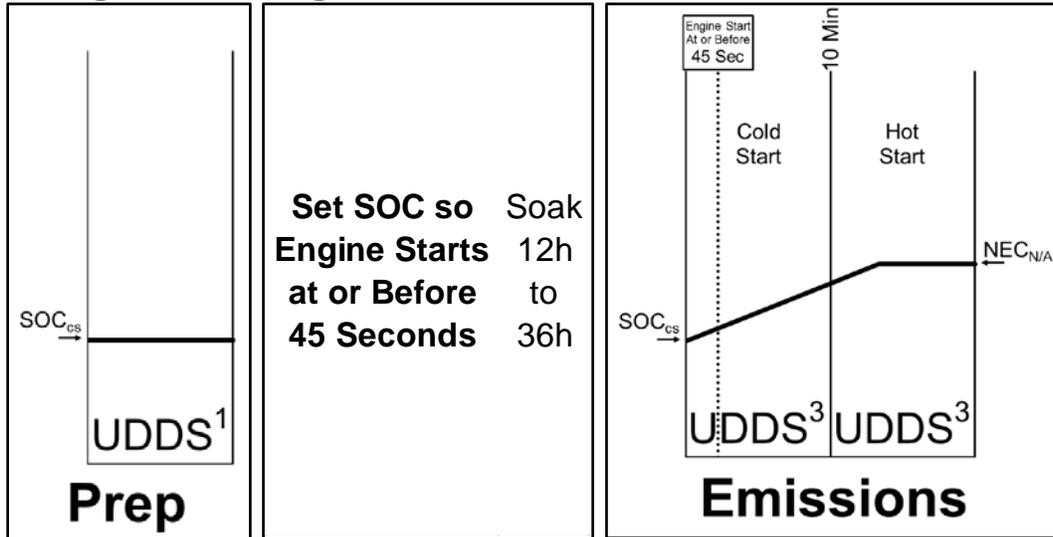
SOC_{Full}: State-of-Charge at full charge

NEC_{Tolerances}: Net Energy Change Tolerances required

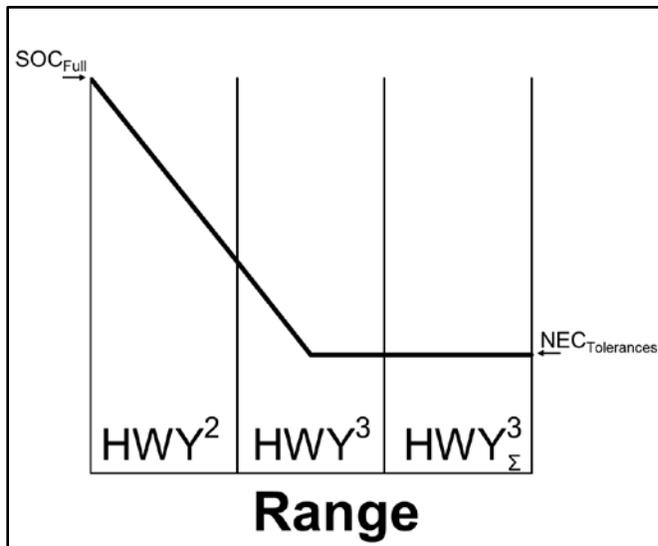
NEC_{N/A}: Net Energy Change Tolerances not applicable

Figure 4

Alternative Urban Emission Test with Charge-Increasing Driver-Selectable Mode Activated



HWY AER and EAER Test



¹ Emission sampling not required

² Emission sampling optional

³ Emission sampling required

HWY_Σ: Multiple HFEDS cycles may be required to satisfy NEC Tolerances

SOC_{cs}: State-of-Charge at charge-sustaining level

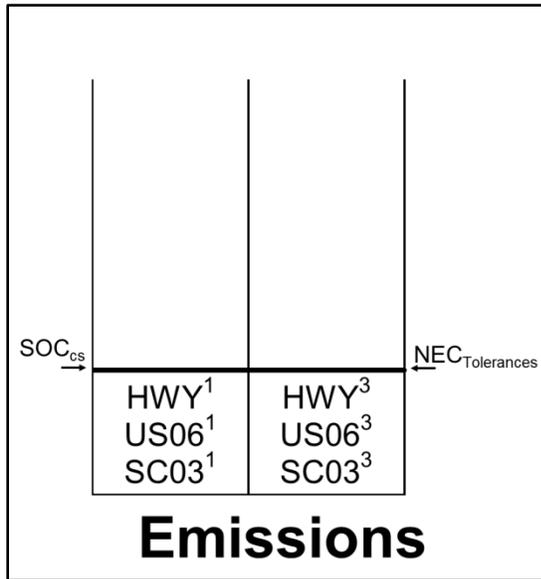
SOC_{Full}: State-of-Charge at full charge

NEC_{Tolerances}: Net Energy Change Tolerances required

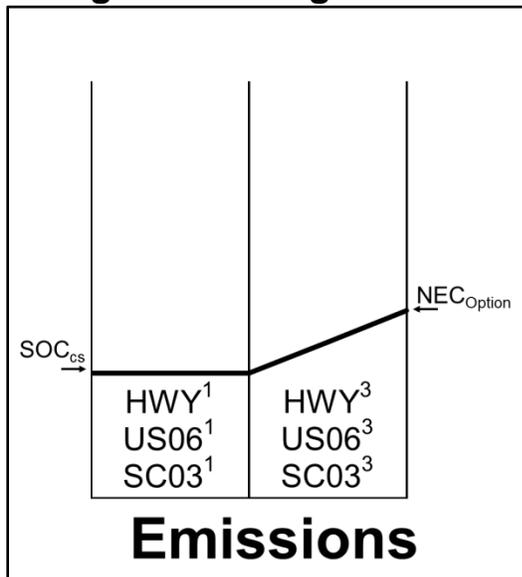
NEC_{N/A}: Net Energy Change Tolerances not applicable

Figure 5

HWY and SFTP Emission Test



HWY and SFTP Emission Test with Charge-Increasing Driver-Selectable Mode Activated



¹ Emission sampling not required

² Emission sampling optional

³ Emission sampling required

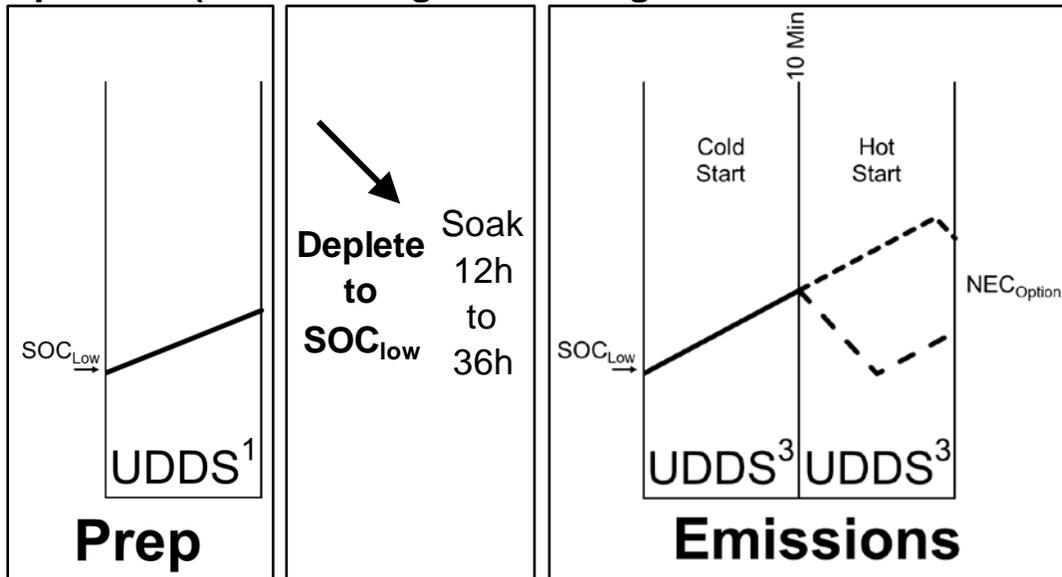
SOC_{cs} : State-of-Charge at charge-sustaining level

$NEC_{Tolerances}$: Net Energy Change Tolerances required

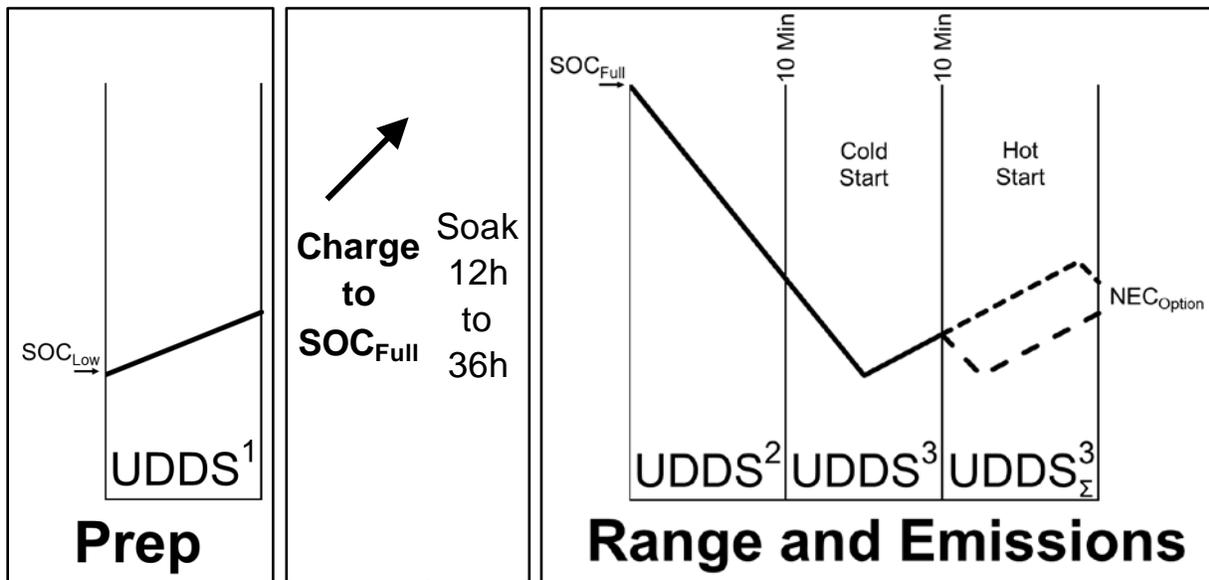
NEC_{Option} : NEC Tolerances apply; however, option available to validate test when SOC final > SOC initial.

Figure 6

Urban Charge-Sustaining Emission Test with Charge-Increasing Operation (not for charge-increasing driver-selectable mode testing)



Urban Charge-Depleting Emission Test with Charge-Increasing Operation (not for charge-increasing driver-selectable mode testing) Includes AER and EAER.



¹ Emission sampling not required

² Emission sampling optional

³ Emission sampling required

UDDS_Σ: Multiple Hot Start UDDS cycles may be required to satisfy NEC Tolerances

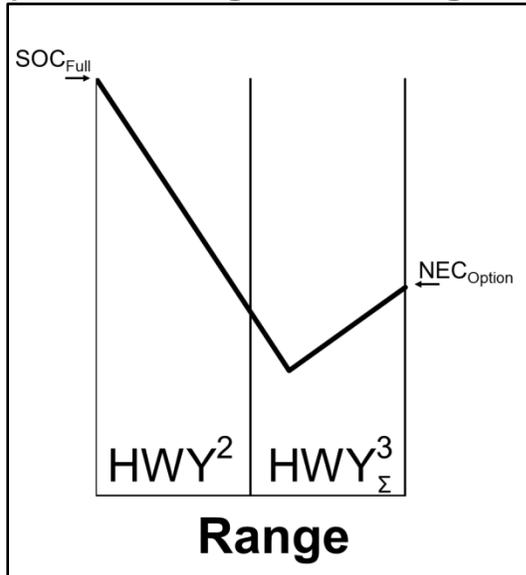
SOC_{Low}: Initial State-of-Charge set at lowest normal SOC allowed by vehicle when driving on UDDS

NEC_{Option}: NEC Tolerances apply; however, option available to validate test when SOC final > SOC initial.

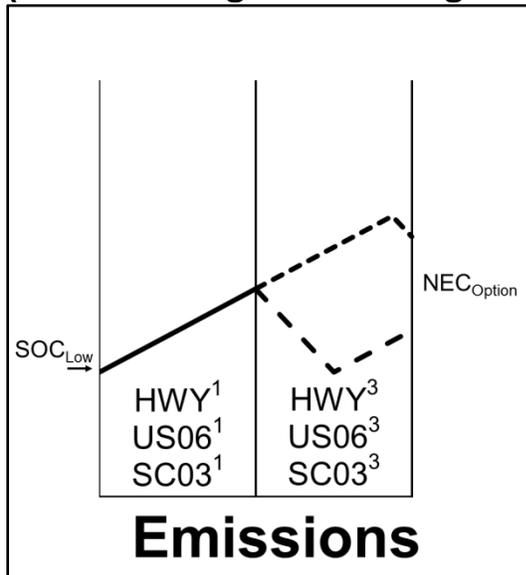
Figure 7

A-76

**HWY AER and EAER Test with Charge-Increasing Operation
(not for charge-increasing driver-selectable mode testing)**



**HWY and SFTP Emission Test with Charge-Increasing Operation
(not for charge-increasing driver-selectable mode testing)**



¹ Emission sampling not required

² Emission sampling optional

³ Emission sampling required

HWY_Σ: Multiple HFEDS cycles may be required to satisfy NEC Tolerances

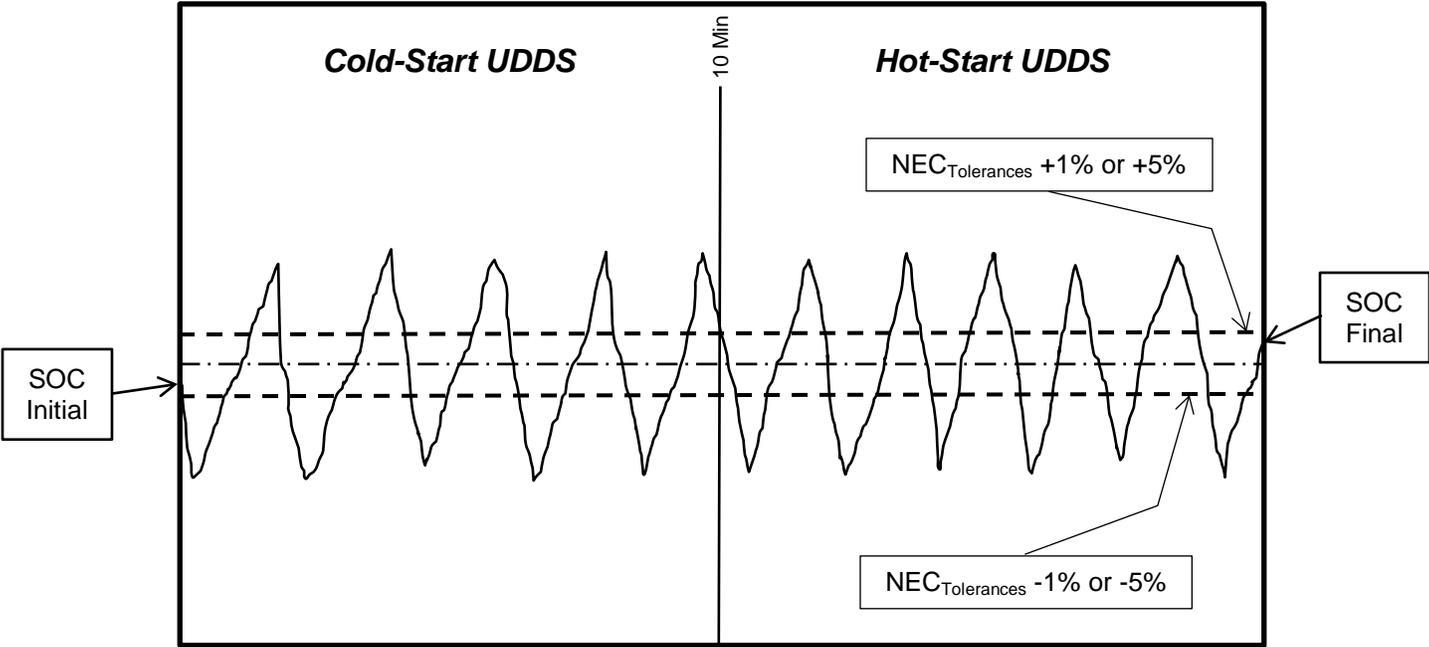
SOC_{Full}: State-of-Charge at full charge

SOC_{Low}: Initial State-of-Charge set at lowest normal SOC allowed by vehicle when driving on UDDS

NEC_{Option}: NEC Tolerances apply; however, option available to validate test when SOC final > SOC initial.

Figure 8

Urban Charge-Sustaining Emission Test – Valid Test



Highway and SFTP Emission Tests – Valid Test

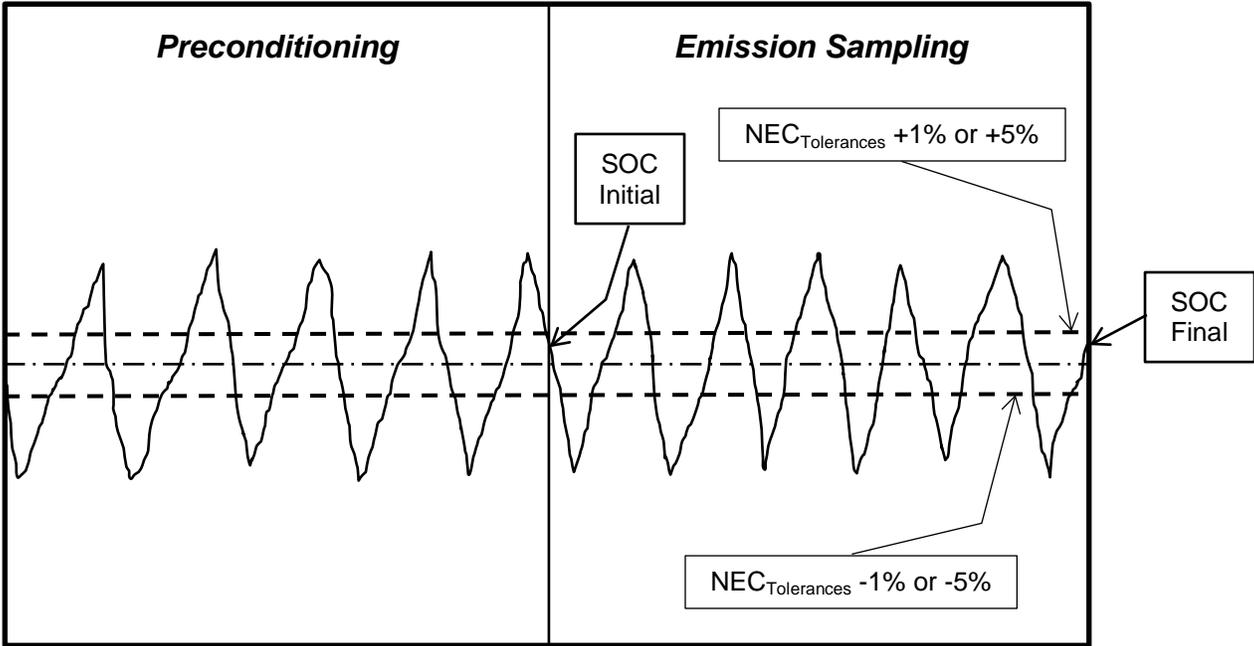


Figure 9

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