

Attachment C

California Environmental Protection Agency
AIR RESOURCES BOARD

PROPOSED 15-DAY MODIFICATIONS

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

Adopted: [insert date here]

[Note: This is a newly adopted incorporated test procedure. This document is printed in a style to indicate changes from the adopted incorporated test procedure. All original language is indicated by plain type. The 15-day proposed modifications are shown in single underline to indicate additions and ~~single-strikeout~~ to indicate deletions. Existing intervening text that is not proposed to be amended is indicated by “* * * *”.]

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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

(incorporated by reference in section 1962.2)

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B. Definitions and Terminology.

1. Definitions.

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“Conventional rounding method” means to increase the last digit to be retained when the following digit is five or greater. Retain the last digit as is when the following digit is four or less.

“Discounted PZEV and AT PZEV credits” means credits earned under section 1962 and 1962.1 by delivery for sale of PZEVs and AT PZEVs, discounted according to subdivision C.7.2(f).

“East Region pool” means the combination of Section 177 states east of the Mississippi River.

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“Energy storage device” means a storage device able to provide the minimum power and energy storage capability to enable engine stop/start capability, traction boost, regenerative braking, and (nominal) charge sustaining mode driving capability. In the case of TZEVs, a minimum range threshold relative to certified, new-vehicle range capability is not specified or required.

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“Hydrogen fuel cell vehicle” means a ZEV that is fueled primarily by hydrogen, but may also have off-vehicle charge capability.

“Hydrogen internal combustion engine vehicle” means a TZEV that is fueled exclusively by hydrogen.

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“West Region pool” means the combination of Section 177 states west of the Mississippi River.

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C. Zero-Emission Vehicle Standards.

1. **ZEV Emission Standard.** The Executive Officer shall certify new 2018 and subsequent passenger cars, light-duty trucks and medium-duty vehicles as ZEVs if the vehicles produce zero exhaust emissions of any criteria pollutant (or precursor pollutant) or greenhouse gas, excluding emissions from air conditioning systems, under any and all possible operational modes and conditions.

2. Percentage ZEV Requirements

2.1 General Percentage ZEV Requirement.

(b) *Calculating the Number of Vehicles to Which the Percentage ZEV Requirement is Applied.* For 2018 and subsequent model years, a manufacturer's production volume for the given model year will be based on the three-year average of the manufacturer's volume of PCs and LDTs, produced and delivered for sale in California in the prior second, third, and fourth model year [for example, 2019 model year ZEV requirements will be based on California production volume average of PCs and LDTs for the 2015 to 2017 model years]. This production averaging is used to determine ZEV requirements only, and has no effect on a manufacturer's size determination (eg. three-year average calculation method). In applying the ZEV requirement, a PC or LDT, that is produced by one manufacturer (e.g., Manufacturer A), but is marketed in California by another manufacturer (e.g., Manufacturer B) under the other manufacturer's (Manufacturer B) nameplate, shall be treated as having been produced by the marketing manufacturer (i.e., Manufacturer B).

(1) *[Reserved]*

(2) *[Reserved]*

(3) A manufacturer may apply to the Executive Officer to be permitted to base its ZEV obligation on the number of PCs and LDTs, produced by the manufacturer and delivered for sale in California that same model year (ie, same model-year calculation method) as an alternative to the three-year averaging of prior year production described above, for up to two model years, total, between model year 2018 and model year 2025. For the same model-year calculation method to be allowed, a manufacturer's application to the Executive Officer must show that their volume of PCs and LDTs produced and delivered for sale in California has decreased by ~~40~~ at least 30 percent from the previous year due to circumstances that were unforeseeable and beyond their control.

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3. Transitional Zero Emission Vehicles (TZEV).

3.1 Introduction. This subdivision C.3 sets forth the criteria for identifying vehicles delivered for sale in California as TZEVs.

3.2 TZEV Requirements. In order for a vehicle to be eligible to receive a ZEV allowance, the manufacturer must demonstrate compliance with all of the following requirements:

(a) *SULEV Standards.* Certify the vehicle to the 150,000-mile SULEV 20 or 30 exhaust emission standards for PCs and LDTs in subdivision 1961.2(a)(1). Bi-fuel, fuel flexible and dual-fuel vehicles must certify to the applicable 150,000-mile SULEV 20 or 30 exhaust emission standards when operating on both fuels. Manufacturers may certify 2018 and 2019 TZEVs to the 150,000-mile SULEV exhaust emission standards for PCs and LDTs in subdivision 1961(a)(1);

(b) *Evaporative Emissions.* Certify the vehicle to the evaporative emission standards in subdivision 1976(b)(1)(G). Manufacturers may certify 2018 and 2019 TZEVs to the evaporative standards for PCs and LDTs in subdivision 1976(b)(1)(E);

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3.3 Allowances for TZEVs.

(a) *Zero Emission Vehicle Miles Traveled TZEV Allowance Calculation.* A vehicle that meets the requirements of subdivision C.3.2 and has zero-emission vehicle miles traveled (VMT), as defined by and calculated by this test procedure and measured as ~~all electric~~ all electric range (EAER) capability will generate allowance according to the following equation:

<i>UDDS Test Cycle Range (R_{cda})</i>	<i>Allowance</i>
<10 all electric miles	0.00
≥10 all electric miles	TZEV Credit = $[(0.01) * R_{cda} \text{EAER} + 0.30]$
>80 miles (credit cap)	1.310

(1) Allowance for US06 Capability. TZEVs with US06 all electric range capability ($R_{cda} \text{AER}$) of at least 10 miles shall earn an additional 0.2 allowance. US06 test cycle range capability shall be determined in accordance with section E.8 of these test procedures.

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4. Qualification for Credits From ZEVs.

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4.5 Credits for 2018 and Subsequent Model Years.

(a) *ZEV Credit Calculations.* Credits from a ZEV delivered for sale are based on the ZEV's UDDS all electric range, determined in accordance with these test procedures using the following equation:

$$\text{ZEV Credit} = (0.01) * (\text{UDDS range}) + 0.50$$

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(e) *Counting Specified ZEVs Placed in Service in a Section 177 State and in California.*

(1) Provisions for 2018 through 2025 Model Years. Large volume manufacturers and intermediate volume manufacturers with credits earned from hydrogen fuel cell vehicles that are certified to the California ZEV standards applicable for the ZEV's model year, delivered for sale and placed in service in California or in a section 177 state, may be counted towards compliance in California and in all section 177 states with the percentage ZEV requirements in subdivision C.2. The credits earned are multiplied by the ratio of a manufacturer's applicable production volume for a model year, as specified in subdivision C.2.1(b), in the state receiving credit to the manufacturer's applicable production volume as specified in subdivision C.2.1(b), for the same model year in California (hereafter, "proportional value"). Credits generated from ZEV placement in a section 177 state will be earned at the proportional value in the section 177 state, and earned in California at the full value specified in subdivision C.4.5(a).

(2) Optional Section 177 State Compliance Path.

(A) Reduced ZEV and TZEV Percentages. Large volume manufacturers and intermediate volume manufacturers that have fully complied with the optional section 177 state compliance path requirements in subdivision 1962.1(d)(5)(E)3. are allowed to meet ZEV percentage requirements and optional TZEV percentages reduced from the minimum ZEV floor percentages and TZEV percentages in subdivision C.2.2(e) in each section 177 state equal to the following percentages of their sales volume determined under subdivision 1962.2(b)(1)(B):

ZEVs

<u>Model Year</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>
<u>Existing Minimum ZEV Floor</u>	<u>2.00%</u>	<u>4.00%</u>	<u>6.00%</u>	<u>8.00%</u>

<u>Section 177 State Adjustment for Optional Compliance Path</u>	<u>62.5%</u>	<u>75%</u>	<u>87.5%</u>	<u>100%</u>
<u>Minimum Section 177 State ZEV Requirement</u>	<u>1.25%</u>	<u>3.00%</u>	<u>5.25%</u>	<u>8.00%</u>

TZEVs

<u>Model Year</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>
<u>Existing TZEZ Percentage</u>	<u>2.50%</u>	<u>3.00%</u>	<u>3.50%</u>	<u>4.00%</u>
<u>Section 177 State Adjustment for Optional Compliance Path</u>	<u>90.00%</u>	<u>100%</u>	<u>100%</u>	<u>100%</u>
<u>New Section 177 State TZEZ Percentage</u>	<u>2.25%</u>	<u>3.00%</u>	<u>3.50%</u>	<u>4.00%</u>

Total Percent Requirement

<u>Model Year</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>
<u>New Total Section 177 State Optional Requirements</u>	<u>3.50%</u>	<u>6.00%</u>	<u>8.75%</u>	<u>12.00%</u>

1. Trading and Transferring ZEV and TZEZ Credits within West Region Pool and East Region Pool. Manufacturers that have fully complied with the optional section 177 state compliance path requirements in subdivision 1962.1(d)(5)(E)3. may trade or transfer specified model year ZEV and TZEZ credits within the West Region pool to meet the same model year requirements in subdivision C.4.5(e)(2)(A) and will incur no premium on their credit values. For example, for a manufacturer to make up a 2019 model year shortfall of 100 credits in State X, the manufacturer may transfer 100 (2019 model year) ZEV credits from State Y, within the West Region pool. Manufacturers that have fully complied with the optional section 177 state compliance path requirements in subdivision 1962.1(d)(5)(E)3. may trade or transfer specified model year ZEV and TZEZ credits within the East Region pool to meet the same model year requirements in subdivision C.4.5(e)(2)(A), and will incur no premium on their credit values. For example, for a manufacturer to make up a 2019 model year shortfall of 100 credits in State W, the manufacturer may transfer 100 (2019 model year) ZEV credits from State Z, within the East Region pool.

2. Trading and Transferring ZEV and TZEZ Credits between the West Region Pool and the East Region Pool. Manufacturers that have fully complied with the optional section 177 state compliance path requirements in subdivision 1962.1(d)(5)(E)3. may trade or transfer specified model year ZEV and TZEZ credits to meet the same model year requirements in subdivision

C.4.5(e)(2)(A).a. between the West Region pool and the East Region pool; however, any credits traded will incur a premium of 30% of their value. For example, in order for a manufacturer to make up a 2019 model year shortfall of 100 credits in the West Region Pool, the manufacturer may transfer 130 (2019 model year) credits from the East Region Pool. No credits may be traded or transferred to the East Region pool or West Region pool from a manufacturer's California ZEV bank, or from the East Region pool or West Region pool to a manufacturer's California ZEV bank.

(B) Reporting Requirements. On an annual basis, by May 1st of the calendar year following the close of a model year, each manufacturer that elects the optional section 177 state compliance path under subdivision 1962.1(d)(5)(E)3 shall submit, in writing, to the Executive Officer and each section 177 state a report, including an itemized list, that indicates where vehicles have been placed within the East Region pool and within the West Region pool. The itemized list shall include the following:

1. The manufacturer's total applicable volume of PCs and LDTs delivered for sale in each section 177 state within the regional pool, as determined under subdivision C.2.1(b).
2. Make, model, vehicle identification number, credit earned, and section 177 state where delivery for sale of each TZEZ and ZEV occurred and to meet manufacturer's requirements under subdivision C.4.5(e)(2)(A).

(C) Failure to Meet Optional Section 177 State Compliance Path Requirements. A manufacturer that elects the optional section 177 state compliance path subdivision 1962.1(d)(5)(E)3 and does not meet the modified percentages in subdivision C.4.5(e)(2)(A) in a model year or make up their deficit within the specified time and with the specified credits allowed by subdivision C.7.7(a) in all section 177 states of the applicable pool, shall be treated as subject to the ZEV percentage requirements in section C.2 in each section 177 state. The pooling provisions in subdivision C.4.5(e)(2)(A) shall not apply. Any transfers of ZEV or TZEZ credits between section 177 states will be null and void if a manufacturer fails to comply, and ZEV or TZEZ credits will return to the section 177 state in which the credits were earned. Penalties shall be calculated separately by each section 177 state where a manufacturer fails to make up the ZEV deficits by the end of the 2018 model year.

(D) The provisions of section C shall apply to a manufacturer electing the optional section 177 state compliance path, except as specifically modified by this subdivision C.4.5(e)(2).

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(g) *BEVx*. A BEVx must meet the following in order to receive credit, based on its zero emission UDDS range, through subdivision C.4.5(a):

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(3) *Minimum Zero Emission Range Requirements*. BEVxs must have a minimum of ~~80~~75 miles UDDS zero emission range.

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7. Generation and Use of ZEV Credits; Calculation of Penalties

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7.2 ZEV Credit Calculations.

(a) *Credits from ZEVs*. The amount of credits earned by a manufacturer in a given model year from ZEVs shall be expressed in units of credits, and shall be equal to the number of credits from ZEVs produced and delivered for sale in California that the manufacturer applies towards meeting the ZEV requirements, or, if applicable, requirements specified under subdivision C.4.5(e)(2)(A) for the model year subtracted from the number of ZEVs produced and delivered for sale in California by the manufacturer in the model year.

(b) *Credits from TZEVs*. The amount of credits earned by a manufacturer in a given model year from TZEVs shall be expressed in units of credits, and shall be equal to the total number of TZEVs produced and delivered for sale in California that the manufacturer applies towards meeting its ZEV requirement, or, if applicable, requirements specified under subdivision C.4.5(e)(2)(A) for the model year subtracted from the total number of ZEV allowances from TZEVs produced and delivered for sale in California by the manufacturer in the model year.

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7.5 ZEV Credits for Transportation Systems.

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(c) *Cap on Use of Transportation System Credits*.

(1) *ZEVs*. Transportation system credits earned or allocated by ZEVs or BEVxs pursuant to subdivision 1962.1 (g)(5), not including any credits earned by the vehicle itself, may be used to satisfy up to one-tenth of a manufacturer's ZEV obligation in any given model year, and may be used to satisfy up to one-tenth of a manufacturer's

ZEV obligation which must be met with ZEVs, as specified in subdivision C.2.2(e), or, if applicable, requirements specified under subdivision C.4.5(e)(2)(A). ~~Manufacturers may not use transportation system credits earned by ZEVs to comply with requirements specified in subdivision C.4.5(f).~~

(2) *TZEVs.* Transportation system credits earned or allocated by TZEVs pursuant to subdivision 1962.1(g)(5), not including all credits earned by the vehicle itself, may be used to satisfy up to one-tenth of the portion of a manufacturer's ZEV obligation that may be met with TZEVs or, if applicable, the portion of a manufacturer's obligation that may be met with TZEVs specified under subdivision C.4.5(e)(2)(A) in any given model year, but may only be used in the same manner as other credits earned by vehicles of that category. ~~Manufacturers may not use transportation system credits earned by TZEVs to comply with requirements specified in subdivision C.4.5(f).~~

7.6 Use of ZEV Credits. A manufacturer may meet the ZEV requirements in a given model year by submitting to the Executive Officer a commensurate amount of ZEV credits, consistent with subdivision C.2. Credits in each of the categories may be used to meet the requirement for that category as well as the requirements for lesser credit earning ZEV categories, but shall not be used to meet the requirement for a greater credit earning ZEV category, except for discounted PZEV and AT PZEV credits. For example, credits produced from TZEVs may be used to comply with the portion of the requirement that may be met with credits from TZEV, but not with the portion that must be satisfied with credits from ZEVs. These credits may be earned previously by the manufacturer or acquired from another party.

(a) *Use of Discounted PZEV and AT PZEV Credits and NEV Credits* For model years 2018 through 2025, discounted PZEV and AT PZEV credits, and NEV credits may be used to satisfy up to one-quarter of the portion of a manufacturer's requirement that can be met with credits from TZEVs or, if applicable, the portion of a manufacturer's obligation that may be met with TZEVs specified under subdivision C.4.5(e)(2)(A). Intermediate volume manufacturers may fulfill their entire requirement with discounted PZEV and AT PZEV credits, and NEV credits in model years 2018 and 2019. These credits may be earned previously by the manufacturer or acquired from another party. Discounted PZEV and AT PZEV credits may no longer be used after model year 2025 compliance.

(b) *Use of BEVx Credits.* BEVx credits may be used to satisfy up to 50% of the portion of a manufacturer's requirement that must be met with ZEV credits.

(c) *GHG-ZEV Over Compliance Credits.*

(1) *Application.* Manufacturers may apply to the Executive Officer, no later than May 1, 2018~~December 31, 2016~~, to be eligible for this subdivision C.7.6(c), based on the following qualifications:

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(2) *Credit Generation and Calculation.* Manufacturers must calculate their over compliance with section 1961.3 requirements for model years 2018 through 2021 based on compliance with the previous model year standard. For example, to generate credits for this subdivision C.7.6(c) for model year 2018, manufacturers would calculate credits based on model year 2017 compliance with section 1961.3.

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(B) Credits earned under section 1961.3(ba)(9) may not be included in the calculation of gCO₂/mile credits for use in the above equation in subdivision (A).

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(3) *Use of GHG-ZEV Over Compliance Credits.* A manufacturer may use no more than the percentage enumerated in the table below to meet either the total ZEV requirement nor the portion of their ZEV requirement that must be met with ZEV credits, with credits earned under this subdivision C.7.6(c).

2018	2019	2020	2021
50%	50%	40%	30%

Credits earned in any given model year under this subdivision C.7.6(c) may only be used in the applicable model year and may not be used in any other model year.

Credits calculated under this provision must also be removed from the GHG compliance bank, and cannot be banked for future compliance toward section 1961.3.

4.——Reporting Requirements.

(4) Reporting Requirements. Annually, manufacturers are required to submit calculations of credits for this subdivision C.7.6(c) for the model year, any remaining credits/debits from previous model years under 1961.3, and projected credits/debits for future years through 2021 under 1961.3 and this subdivision C.7.6(c).

a.——If a manufacturer, who has been granted the ability to generate credits under this subdivision C.7.6(c), fails to over comply by at least 2.0 gCO₂/mile in any one year, the manufacturer will be subject to the full ZEV requirements for the model year and future model years, and will not be able to earn credits for any other model year under this subdivision C.7.6(c).

(5) If the Executive Officer does not make a determination that a Federal greenhouse gas fleet standard is functionally equivalent to subdivision 1961.3, than this subdivision C.7.6(c)(1) through (4) is unavailable for use by any manufacturer.

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F. Test Procedures for 20128 and Subsequent Model Zero-Emission Vehicles (including Fuel Cell Vehicles and Hybrid Fuel Cell Vehicles) and All 2012 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 referenced by this document are the dates identified in the “California Exhaust Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles.” 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. ~~A manufacturer may elect to certify a 2009, 2010, or 2011 model year zero emission vehicle or hybrid electric vehicle, except an off-vehicle charge capable hybrid electric vehicle, using this section E.~~

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G. Test Procedures for 20128 and Subsequent Model Off-Vehicle Charge Capable Hybrid Electric Vehicles.

The “as adopted or amended dates” of the 40 CFR Part 86 regulations referenced by this document are the dates identified in the “California Exhaust Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles,” unless otherwise noted. ~~A manufacturer may elect to certify a 2009, 2010, or 2011 model year off-vehicle charge capable hybrid electric vehicle using this section G.~~

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J. ~~Test Procedures for 2009 through 2011 Model Zero-Emission Vehicles and Hybrid-Electric Vehicles.~~

~~The “as adopted or amended dates” of the 40 CFR Part 86 regulations referenced by this document are the dates identified in the “California Exhaust Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light Duty Trucks and Medium Duty Vehicles.”~~

1. ~~Electric Dynamometer.~~ ~~All ZEVs must be tested using a 48-inch single roll electric dynamometer meeting the requirements of 40 CFR Subpart B, §86.108-00(b)(2).~~

2. ~~Vehicle and Battery Break-In Period.~~ ~~A manufacturer shall use good~~

engineering judgment in determining the proper stabilized emissions mileage test point and report same according to the requirements of section D.2.11 above.

~~3. All-Electric Range Test.~~ All 2009 through 2011 ZEVs and only off-vehicle charge capable hybrid electric vehicles shall be subject to the All-Electric Range Test specified below for the purpose of determining the energy efficiency and operating range of a ZEV or of an off-vehicle charge capable hybrid electric vehicle operating without the use of its auxiliary power unit. For hybrid electric vehicles, the manufacturer may elect to conduct the All-Electric Range Test prior to vehicle preconditioning in the exhaust and evaporative emission test sequence specified in the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles".

~~3.1 Cold soak.~~ The vehicle shall be stored at an ambient temperature not less than 68°F (20°C) and not more than 86°F (30°C) for 12 to 36 hours. During this time, the vehicle's battery shall be charged to a full state of charge.

~~3.2 Driving schedule.~~

~~3.2.1 Determination of Urban All-Electric Range.~~

(a) At the end of the cold soak period, the vehicle shall be placed, either driven or pushed, onto a dynamometer and operated through successive Urban Dynamometer Driving Schedules (UDDS), 40 CFR, Part 86, Appendix I, which is incorporated herein by reference. A 10-minute soak shall follow each UDDS cycle.

(b) 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 §86.115-00 (b)(1) and (2), or the manufacturer determines that the test should be terminated for safety reasons, e.g. excessively high battery temperature, abnormally low battery voltage, etc. For off-vehicle charge capable hybrid electric vehicles, this determination shall be performed without the use of the auxiliary power unit.

(c) 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). 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. For off-vehicle charge capable hybrid electric vehicles, this determination shall be performed without the use of the auxiliary power unit.

~~3.2.2 Determination of Highway All-Electric Range.~~

~~(a) At the end of the cold soak period, the vehicle shall be placed, either driven or pushed, onto a dynamometer and operated through two successive Highway Fuel Economy Driving Schedules (HFEDS), 40 CFR, Part 600, Appendix I, which is incorporated herein by reference. There shall be a 15 second zero speed with key on and brake depressed between two cycles and a 10-minute soak following the two HFEDS cycles.~~

~~(b) 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), or the manufacturer determines that the test should be terminated for safety reasons, e.g. excessively high battery temperature, abnormally low battery voltage, etc. For off-vehicle charge capable hybrid electric vehicles, this determination is optional and shall be performed without the use of the auxiliary power unit.~~

~~(c) 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). 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 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. For off-vehicle charge capable hybrid electric vehicles, this determination shall be performed without the use of the auxiliary power unit.~~

~~(d) NEVs are exempt from the highway all-electric range test.~~

3.2.3 Recording requirements. ~~Once the vehicle is no longer able to maintain the speed and time requirements specified in (2) above, or once the auxiliary power unit turns on, in the case of an off-vehicle charge capable hybrid electric vehicle, the vehicle shall be brought to an immediate stop and the following data recorded:~~

- ~~(a) — mileage accumulated during the All-Electric Range Test;~~
- ~~(b) — Net DC energy from the battery that was expended during the All-Electric Range Test (may be reported as the total DC battery energy output and the total DC battery energy input during the All-Electric Range Test);~~
- ~~(c) — AC energy required to fully charge the battery after the All-Electric Range Test from the point where electricity is introduced from the electric outlet to the battery charger; and~~
- ~~(d) — DC energy required to fully charge the battery after the All-Electric Range~~

~~Test from the point where electricity is introduced from the battery charger to the battery.~~

~~Battery charging shall begin within 1 hour after terminating the All Electric Range Test.~~

~~3.2.4 **Regenerative braking.** Regenerative braking systems may be utilized during the range test. The braking level, if adjustable, shall be set according to the manufacturer's specifications prior to the commencement of the test. The driving schedule speed and time tolerances specified in (2) shall not be exceeded due to the operation of the regenerative braking system.~~

~~4. **Determination of Battery Specific Energy for ZEVs.**~~

~~Determine the specific energy of batteries used to power a ZEV in accordance with the U.S. Advanced Battery Consortium's Electric Vehicle Battery Procedure Manual (January 1996), Procedure No. 2, "Constant Current Discharge Test Series," using the C/3 rate. The weight calculation must reflect a completely functional battery system as defined in the Appendix of the Manual, including pack(s), required support ancillaries (e.g., thermal management), and electronic controller.~~

~~5. **Determination of the Emissions of the Fuel-fired Heater for Vehicles Other Than ZEVs.**~~

~~The exhaust emissions result of the fuel-fired heater shall be determined by operating at a maximum heating capacity with a cold start between 68°F and 86°F for a period of 20 minutes and dividing the grams of emissions by 20. The resulting grams per minute shall be multiplied by 3.0 minutes per mile for a grams per mile value.~~

~~6. **Hybrid Electric Vehicle FTP Emission Test Provisions.**~~

~~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.~~

~~6.1 **Vehicle Preconditioning.**~~

~~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:~~

~~6.1.1 Battery state of charge shall be set prior to initial fuel drain and fill before vehicle preconditioning.~~

~~6.1.2 For hybrid electric 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 hybrid~~

~~electric vehicle to operate the auxiliary power unit for the maximum possible cumulative amount of time during the preconditioning drive.~~

~~6.1.3 For hybrid electric vehicles that allow manual activation of the auxiliary power unit, battery state of charge shall be set at a level that satisfies one of the following conditions:~~

~~(i) If the hybrid electric vehicle is charge sustaining over the UDDS, battery state of charge shall be set at the lowest level allowed by the manufacturer.~~

~~(ii) If the hybrid electric vehicle is charge depleting over the UDDS, battery state of charge shall be set at the level recommended by the manufacturer for activating the auxiliary power unit when operating in urban driving conditions.~~

~~6.1.4 After setting battery state of charge, the hybrid electric vehicle shall be pushed or towed to a work area for fuel drain and fill according to sections D.1.1. and D.1.2. of the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles".~~

~~6.1.5 Following fuel drain and fill, the vehicle shall be pushed or towed into position on a dynamometer and preconditioned. If the auxiliary power unit is capable of being manually activated, the auxiliary power unit shall be manually activated at the beginning of and operated throughout the preconditioning drive.~~

~~6.1.6 Within five minutes of completing preconditioning drive, battery state of charge shall be set at a level that satisfies one of the following conditions:~~

~~(i) If the hybrid electric vehicle does not allow manual activation of the auxiliary power unit and is charge sustaining over the UDDS, then set battery state of charge to a level such that the SOC Criterion (see section B., Definitions, of these procedures) would be satisfied for the dynamometer procedure (section 6.2 of these procedures). If off vehicle charging is required to increase battery state of charge for proper setting, off vehicle charging shall occur during 12 to 36 hour soak period.~~

~~(ii) If the hybrid electric vehicle does not allow manual activation of the auxiliary power unit and is charge depleting over the UDDS, then no battery state of charge adjustment is permissible.~~

~~(iii) If the hybrid electric vehicle does allow manual activation of the auxiliary power unit, then set battery state of charge to manufacturer recommended level for activating the auxiliary power unit when the hybrid electric vehicle is operating in urban driving conditions.~~

6.2 ~~Dynamometer Procedure~~

~~To be conducted pursuant to 40 CFR § 86.135-00 with the following revisions:~~

~~6.2.1 Amend subparagraph (a): Overview. The dynamometer run consists of two tests, a “cold” start test, after a minimum 12-hour and a maximum 36-hour soak 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. Vehicle startup (with all accessories turned off), operation over the UDDS and vehicle shutdown make a complete cold start test. Vehicle startup and operation over the UDDS and vehicle shutdown make a complete hot start test. The exhaust emissions are diluted with ambient air in the dilution tunnel as shown in Figure B94-5 and Figure B94-6. A dilution tunnel is not required for testing vehicles waived from the requirement to measure particulates. Four particulate samples are collected on filters for weighing; the first sample plus backup is collected during the cold start test (including shutdown); the second sample plus backup is collected during the hot start test (including shutdown). Continuous proportional samples of gaseous emissions are collected for analysis during each test. For hybrid electric vehicles with gasoline-fueled, natural gas-fueled and liquefied petroleum gas-fueled Otto-cycle auxiliary power units, the composite samples collected in bags are analyzed for THC, CO, CO₂, CH₄ and NO_x. For hybrid electric vehicles with petroleum-fueled diesel cycle auxiliary power units (optional for natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled diesel cycle vehicles), THC is sampled and analyzed continuously pursuant to the provisions of § 86.110. Parallel samples of the dilution air are similarly analyzed for THC, CO, CO₂, CH₄ and NO_x. For hybrid electric vehicles with natural gas-fueled, liquefied petroleum gas-fueled and methanol-fueled auxiliary power units, bag samples are collected and analyzed for THC (if not sampled continuously), CO, CO₂, CH₄ and NO_x. For hybrid electric vehicles with methanol-fueled auxiliary power units, methanol and formaldehyde samples are taken for both exhaust emissions and dilution air (a single dilution air formaldehyde sample, covering the total test period may be collected). Parallel bag samples of dilution air are analyzed for THC, CO, CO₂, CH₄ and NO_x.~~

~~6.2.2 Subparagraph (d). [No change.]~~

~~6.2.3 Amend subparagraph (h): The driving distance, as measured by counting the number of dynamometer roll or shaft revolutions, shall be determined for the cold start test and hot start test. The revolutions shall be measured on the same roll or shaft used for measuring the vehicle’s speed.~~

6.3—Dynamometer Test Run, Gaseous and Particulate Emissions

To be conducted pursuant to 40 CFR § 86.137-96 with the following revisions:

~~6.3.1 Amend subparagraph (a): General. The dynamometer run consists of two tests, a cold start test, after a minimum 12-hour and a maximum 36-hour soak 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 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 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 is allowed to stand on the dynamometer during the 10 minute time period between the cold and hot start tests.~~

~~6.3.2 Amend subparagraph (b)(9): Start the gas flow measuring device, position the sample selector valves to direct the sample flow into the exhaust sample bag, the methanol exhaust sample, the formaldehyde exhaust sample, the dilution air sample bag, the methanol dilution air sample and the formaldehyde dilution air sample (turn on the petroleum fueled diesel cycle THC analyzer system integrator, mark the recorder chart, start particulate sample pump No. 1, and record both gas meter or flow measurement instrument readings, if applicable), and turn the key on. If the auxiliary power unit is capable of being manually activated, the auxiliary power unit shall be activated at the beginning of and operated throughout the UDDS.~~

~~6.3.2 Delete subparagraph (13).~~

~~6.3.3 Amend subparagraph (14): Turn the vehicle off 2 seconds after the end of the last deceleration (at 1,369 seconds).~~

~~6.3.4 Amend subparagraph (15): Five seconds after the vehicle is shutdown, simultaneously turn off gas flow measuring device No. 1 and if applicable, turn off the hydrocarbon integrator No. 1, mark the hydrocarbon recorder chart, turn off the No. 1 particulate sample pump and close the valves isolating particulate filter No. 1, and position the sample selector valves to the "standby" position. Record the measured roll or shaft revolutions (both gas meter or flow measurement instrumentation readings), and reset the counter. As soon as possible, transfer the exhaust and dilution air samples to the analytical system and process the samples pursuant to § 86.140, obtaining a stabilized reading of the exhaust bag sample on all analyzers within 20 minutes of the end of the sample collection phase of the test. Obtain methanol and formaldehyde sample analyses, if applicable, within 24 hours of the end of the sample period. (If it is not possible to perform analysis on the methanol and formaldehyde samples~~

~~within 24 hours, the samples should be stored in a dark cold (4°C to 10°C) environment until analysis. The samples should be analyzed within fourteen days.) If applicable, carefully remove both pairs of particulate sample filters from their respective holders, and place each in a separate petri dish, and cover.~~

~~6.3.3 Amend subparagraph (18): Repeat the steps in paragraphs (b)(2) through (b)(17) of this section for the hot start test. The step in paragraph (b)(9) of this section shall begin between 9 and 11 minutes after the end of the sample period for the cold start test.~~

~~6.3.4 Delete subparagraph (19).~~

~~6.3.5 Delete subparagraph (20).~~

~~6.3.6 Amend subparagraph (21): As soon as possible, and in no case longer than one hour after the end of the hot start phase of the test, transfer the four particulate filters to the weighing chamber for post-test conditioning, if applicable. For hybrid electric vehicles that do not allow manual activation of the auxiliary power unit and are charge sustaining over the UDDS, a valid test shall satisfy the SOC Criterion (see Definitions, section B of these procedures).~~

~~6.3.7 Amend subparagraph (24): Vehicles to be tested for evaporative emissions will proceed pursuant to the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles".~~

6.4 Calculations - Exhaust Emissions

~~To be conducted pursuant to 40 CFR §86.144-94 with the following revisions:~~

~~6.4.1 Amend subparagraph (a): For light-duty vehicles and light duty trucks:~~

$$Y_{wm} = 0.43 * Y_c + 0.57 * Y_h$$

$$D_c \quad D_h$$

~~Where:~~

~~(1) Y_{wm} = Weighted mass emissions of each pollutant, i.e., THC, CO, THCE, NMHC, NMHCE, CH₄, NO_x, or CO₂, in grams per vehicle mile.~~

~~(2) Y_c = Mass emissions as calculated from the cold start test, in grams per test.~~

~~(3) Y_h = Mass emissions as calculated from the hot start test, in grams per test.~~

~~(4) D_c = The measured driving distance from the cold start test, in~~

miles.

(5) ~~D_h = The measured driving distance from the hot start test, in~~

miles.

6.5 Calculations - Particulate Emissions

~~To be conducted pursuant to 40 CFR §86.145-82 with the following revisions:~~

~~6.5.1 Amend subparagraph (a): The final reported test results for the mass particulate (M_p) in grams/mile shall be computed as follows:~~

$$M_p = 0.43 \frac{M_{pc}}{D_c} + 0.57 \frac{M_{ph}}{D_h}$$

~~Where:~~

~~(1) M_{pc} = Mass of particulate determined from the cold start test, in grams per vehicle mile. (See § 86.110-94 for determination.)~~

~~(2) M_{ph} = Mass of particulate determined from the hot start test, in grams per vehicle mile. (See § 86.110-94 for determination.)~~

~~(3) D_c = The measured driving distance from the cold start test, in miles.~~

~~(4) D_h = The measured driving distance from the hot start test, in miles.~~

7. Hybrid Electric Vehicle Highway Emission Test Provisions

~~To be conducted pursuant to 40 CFR § 600.111-93 with the following revisions:~~

~~7.1 Amend subparagraph (b)(2): The highway fuel economy test is designated to simulate non-metropolitan driving with an average speed of 48.6 mph and a maximum speed of 60 mph. The cycle is 10.2 miles long with 0.2 stop per mile and consists of warmed up vehicle operation on a chassis dynamometer through a specified driving cycle. A proportional part of the diluted exhaust emission is collected continuously for subsequent analysis of THC, CO, CO₂, and NO_x using a constant volume (variable dilution) sampler. Diesel dilute exhaust is continuously analyzed for hydrocarbons using a heated sample line and analyzer. Methanol and formaldehyde samples are collected and individually analyzed for methanol fueled vehicles.~~

~~7.2 Amend subparagraph (f)(3): Only one exhaust sample and one background sample are collected and analyzed for THC (except diesel hydrocarbons which are analyzed continuously), CO, CO₂, and NO_x. Methanol and formaldehyde samples (exhaust and dilution air) are collected and analyzed for methanol fueled vehicles.~~

~~7.3—Add subparagraph (f)(5): Battery state-of-charge shall be set prior to performing the HFEDS preconditioning cycle. For hybrid electric 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 hybrid electric vehicle to operate the auxiliary power unit for the maximum possible cumulative amount of time during the HFEDS preconditioning cycle. For hybrid electric vehicles that allow manual activation of the auxiliary power unit, battery state-of-charge shall be set at a level that satisfies one of the following conditions:~~

~~(i)—If the hybrid electric vehicle is charge-sustaining over the HFEDS, battery state-of-charge shall be set at the lowest level allowed by the manufacturer.~~

~~(ii)—If the hybrid electric vehicle is charge-depleting over the HFEDS, battery state-of-charge shall be set at the level recommended by the manufacturer for activating the auxiliary power unit when operating in highway driving conditions.~~

~~7.4—Amend subparagraph (h)(5): Operate the vehicle over one HFEDS preconditioning cycle according to the dynamometer driving schedule specified in §600.109(b). If the auxiliary power unit is capable of being manually activated, the auxiliary power unit shall be manually activated at the beginning of and operated throughout the HFEDS preconditioning cycle.~~

~~7.5—Amend subparagraph (h)(6): When the vehicle reaches zero speed at the end of the HFEDS preconditioning cycle, the driver has 17 seconds to prepare for the HFEDS emission measurement cycle of the test. Reset and enable the roll revolution counter. During the idle period, one of the following conditions shall apply:~~

~~(i)—For hybrid electric vehicles that do not allow the auxiliary power unit to be manually activated and are charge-sustaining over the HFEDS, the vehicle shall be momentarily turned off for 5 seconds and turned back on during the idle period. The battery state-of-charge shall be recorded after the hybrid electric vehicle has fully turned on.~~

~~(ii)—For hybrid electric vehicles that do not allow the auxiliary power unit to be manually activated and are charge-depleting over the HFEDS, the vehicle shall remain turned on during the idle period.~~

~~(iii)—For hybrid electric vehicles that allow the auxiliary power unit to be manually activated, the vehicle shall remain turned on with the auxiliary power unit operating during the idle period.~~

~~7.6—Add subparagraph (h)(9): At the conclusion of the HFEDS emission test,~~

~~one of the following conditions shall apply:~~

~~(i) For hybrid electric vehicles that do not allow the auxiliary power unit to be manually activated and are charge sustaining over the HFEDS, record the battery state of charge to determine if the SOC Criterion (see Definitions, section B of these procedures) is satisfied. If the SOC Criterion is not satisfied, then repeat dynamometer test run from subparagraph (h)(6). A total of three highway emission tests shall be allowed to satisfy the SOC Criterion. Manufacturers may elect to repeat dynamometer test run from subparagraph (h)(6) if battery energy level increased significantly relative to the initial battery state of charge set at the beginning of the HFEDS emission test.~~

~~(ii) For hybrid electric vehicles that do not allow the auxiliary power unit to be manually activated and are charge depleting over the HFEDS, the emission test is completed.~~

~~(iii) For hybrid electric vehicles that allow the auxiliary power unit to be manually activated, the emission test is completed.~~

KJ. Advanced Technology Demonstration Program data requirements.

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