Appendix F-6

Purpose and Rationale

California Test Procedures For 2026 And Subsequent Model Year Zero-Emission Vehicles And Plug-In Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes

Section A. Applicability 1. through 4.

Purpose:

The purpose of these subsections is the describe which vehicles this test procedure applies to, which are zero emission vehicles and plug-in hybrid electric vehicles in 2026 and subsequent model years in the passenger car, light-duty truck, and medium-duty vehicle classes. This subsection also describes that general certification procedures and requirements are contained in the "California 2015 through 2025 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" or the "California 2026 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures for Passenger Cars, Light Duty Trucks, and Medium Duty Vehicles", as applicable. This subsection also specifies what is meant by as adopted or amended dates, and explains that procedures for measuring exhaust emissions per title 14, Code of Federal Regulations, Part 86 to part 1066 need to be done in accordance with the modifications in the California criteria pollutant and greenhouse gas test procedures, as applicable.

Rationale:

These subsections are necessary to define which model years and vehicle types the test procedure is applicable to. The applicability subsection clarifies that the procedures, incorporated by reference in California Code of regulations, title 13, section 1962.4 are applicable to 2026 and subsequent model year zero-emission vehicles and plug-in electric vehicles certified for sale in California. These subsections are also necessary to point manufacturers to other test procedures that are necessary to follow for certifying applicable vehicles in California. Throughout these test procedures, requirements of existing test procedures are incorporated and continue to apply. These existing requirements remain valid for ensuring vehicles meet the

regulatory requirements. It is necessary to continue these requirements for consistency and to ensure compliance is reliably determined. In the interests of brevity, the rationales below identify where existing requirements are incorporated for this reason.

Section B. Definitions and Terminology

"All-Electric Range (AER)"

Purpose:

The purpose of this definition is to define the total miles driven electrically after the battery has been fully charged and, in the case of a plug-in hybrid electric vehicle, before the engine turns on for the first time.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary for calculating compliance in CCR, title 13, sections 1961.3, 1961.4, and 1962.4

"All-Electric Range Test"

Purpose:

The purpose of this definition is to define the test sequence used to determine the range of a battery electric vehicle, or, a plug-in hybrid electric vehicle without the use of its engine.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary for calculating all electric range.

"Alternative Continuous Urban Test Schedule"

Purpose:

The purpose of this definition is to define a series of the following sequence: UDDS, 10 minute key-off hot soak, UDDS, and 10-30 minute key-off hot soak.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define an alternate continuous urban test schedule in the case that the Continuous Urban Test Schedule cannot be performed.

"Alternative Continuous Highway Test Schedule"

Purpose:

The purpose of this definition is to define a series of the following sequence: HFEDS, 15 second key-on pause, HFEDS, and 10-30 minute key-off hot soak or a 15 second key-on pause.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define an alternate continuous urban test schedule in the case that the Continuous Highway Test Schedule cannot be performed.

"Battery electric vehicle (BEV)"

Purpose:

The purpose of this definition is to define any vehicle that operates solely by use of a battery or battery pack, or that is powered primarily through the use of an electric battery or battery pack but uses a flywheel or capacitor that stores energy produced by the electric motor or through regenerative braking to assist in vehicle operation.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define a zero emission vehicle technologies that would be produced and delivered for sale in compliance with California Code of Regulations, title 13, sections 1961.3 and 1962.4, and certified by these test procedures.

"Battery" or "battery pack" or "high voltage battery pack" or "traction battery"

Purpose:

The purpose of this definition is to define any electrical energy storage device consisting of any number of individual battery modules or cells that is used to supply power to propel a zero-emission vehicle, or plug-in hybrid electric vehicle. This definition also clarifies that these terms may also generically refer to capacitor and flywheel energy storage devices used to supply power for propulsion of the vehicle.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes" and is necessary to describe what a battery is, as there are several references to this particular technology in these test procedures.

"Battery state-of-charge (SOC)"

Purpose:

The purpose of this definition is to define the remaining level of charge in the battery relative to the maximum level of charge of the battery expressed in percent. This term may also generically refer to the state-of-charge for other energy storage devices such as a capacitor or flywheel in lieu of or in addition to a battery.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes" and is necessary to describe what a battery state of charge, as there are several references to this term throughout these test procedures, and will have an effect on the outcome of various test.

"Blended plug-in hybrid electric vehicle (PHEV)"

Purpose:

The purpose of this definition is to define a plug-in hybrid electric vehicle (PHEV) that uses the engine during charge depleting operation.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define a technology that would be produced and delivered for sale in compliance with California Code of Regulations, title 13, sections 1961.3 and 1961.4, and certified by these test procedures.

"Charge-depleting (CD) operation"

Purpose:

The purpose of this definition is to define a type of vehicle operation in which the battery SOC may fluctuate but, on average, decreases while the vehicle is driven.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary type of vehicle operation that determines the emission impact of plug-in hybrid electric vehicles.

"Charge-depleting actual range, urban" or "R_{cdau}"

Purpose:

The purpose of this definition is to define the distance traveled on the Urban Charge-Depleting Test Procedure at which the state-of-charge is first equal to the average state-of-charge of the two consecutive UDDS cycles used to end the Urban Charge Depleting Test Procedure and to define that it must be reported to the nearest 0.1 miles.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary measurement of distance to calculate the emission impact of plug-in hybrid electric vehicles.

"Charge-depleting actual range, highway" or "R_{cdah}"

Purpose:

The purpose of this definition is to define the distance traveled on the Highway Charge-Depleting Test Procedure at which the state-of-charge is first equal to the average state-of-charge of the HFEDS cycle used to end the Highway Charge Depleting Test Procedure and to define that it must be reported to the nearest 0.1 miles.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary measurement of distance to calculate the emission impact of plug-in hybrid electric vehicles.

"Charge-depleting cycle range" or "R_{cdc}"

Purpose:

The purpose of this definition is to define the distance traveled on the Urban or Highway Charge-Depleting Test Procedure up to the test cycle prior to where the state-of-charge is above the lower bound state-of-charge tolerance for one test

cycle. This range will appear as the sum of a discrete number of test cycle distances and to define that it must be reported to the nearest 0.1 miles.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary measurement of distance to calculate the emission impact of plug-in hybrid electric vehicles.

"Charge-increasing operation"

Purpose:

This purpose of this definition is to define a type of vehicle operation that occurs when the battery SOC may fluctuate but, on average, increases while the vehicle is driven over two or more consecutive UDDS cycles. The definition also includes directions to test plug-in hybrid electric vehicles or plug-in fuel cell electric vehicles with charge-increasing operation, follow the test requirements for charge-sustaining operation in section D.5 with the modifications specific to charge-increasing operation. The definition also excludes charge-increasing driver-selectable mode from this definition as it is considered a type of mode and not a type of operation.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define this type of vehicle operation for properly testing vehicles to accurately measure emissions and electric operation.

"Charge-sustaining (CS) operation"

Purpose:

The purpose of this definition is to define a type of vehicle operation in which the battery SOC may fluctuate but, on average, is maintained at a certain level while the vehicle is driven.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define this type of vehicle operation for properly testing vehicles to accurately measure emissions and electric operation.

"Cold start UDDS"

Purpose:

The purpose of this definition is to define the first UDDS cycle in which the engine turns on.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary determine when an engine start has occurred.

"Consumable fuel"

Purpose:

The purpose of this definition is to define any solid, liquid, or gaseous matter that releases energy when consumed by an auxiliary power unit such as an engine.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define because this term is used throughout various calculations in these test procedures.

"Constant speed cycle (CSC)"

Purpose:

The purpose of this definition is to define a driving trace that accelerates smoothly from a vehicle speed of zero up to the designated vehicle speed within one minute or less and then remains at a steady state speed at the designated vehicle speed. For example, a 65 miles per hour CSC shall use 65 miles per hour as the designated vehicle speed.

Rationale:

The constant speed cycle is necessary to define because it is a part of the short multi-cycle range and energy consumption test method that is used to determine the all-electric range for a battery electric vehicle.

"Continuous Highway Test Schedule"

Purpose:

The purpose of this definition it to define a repeated series comprised of four consecutive key-on Highway Fuel Economy Driving Schedules (HFEDS) with a 15 second key-on pause in-between each HFEDS cycle. If this schedule cannot be performed continuously, a key-off soak up to 30 minutes is permitted after every fourth HFEDS cycle.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define a drive schedule that is relied upon for emission and electric range testing for ZEVs and plug-in hybrid electric vehicles.

"Continuous Urban Test Schedule"

Purpose:

The purpose of this definition is to define a repeated series comprised of Urban Dynamometer Driving Schedules (UDDS), 40 CFR, Part 86, Appendix I, which is incorporated herein by reference; each test is followed by a 10 minute key-off soak period.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define a drive schedule that is relied upon for emission and electric range testing for ZEVs and plug-in hybrid electric vehicles.

"Continuous US06 Test Schedule"

Purpose:

The purpose of this definition is to define a repeated series of US06 driving schedules (US06) with a key-on idle period of not less than one minute and not greater than two minutes between each US06.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define a drive schedule that is relied upon for emission and electric range testing for ZEVs and plug-in hybrid electric vehicles.

"Default mode"

Purpose:

The purpose of this definition is to define the operating mode to which the vehicle automatically reverts after a vehicle is turned off and subsequently turned on and to further define that a vehicle with default mode would require the driver to select an alternative mode each time the vehicle is turned on if the driver chooses to use an alternative mode.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty

Truck And Medium-Duty Vehicle Classes", and is necessary to define the operating mode by which plug-in hybrid electric vehicles must be tested in.

"Driver-selectable mode"

Purpose:

The purpose of this definition is to define an operating mode that the vehicle driver can manually engage by means of an instrument panel button, switch, screen menu, etc., anytime the vehicle is activated (e.g., when the key is in the on position).

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define the operating mode by which plug-in hybrid electric vehicles may not be tested in.

"Electric range fraction"

Purpose:

The purpose of this definition is to define the fraction of electrical energy derived from off-vehicle charging and regenerative braking energy relative to total traction energy used over the charge depletion range on a specified drive cycle.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary calculation to electric operation of blended PHEVs, and to determine PHEV emissions.

"Energy storage device"

Purpose:

The purpose of this definition is to define 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 operation.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to include a broad term for multiple types of vehicles.

"Equivalent all-electric range (EAER)"

Purpose:

The purpose of this definition is to define the portion of the total charge-depleting range attributable to the use of electricity from the battery over a charge-depleting test.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define a technology that would be produced and delivered for sale in compliance with California Code of Regulations, title 13, sections 1961.3 and 1961.4, and certified by these test procedures.

"Fuel cell electric vehicle (FCEV)"

Purpose:

The purpose of this definition is to define any vehicle that uses an onboard hydrogen fuel cell system, with or without the use of other energy storage devices, to supply power for propulsion of the vehicle. For the purposes of these test procedures, FCEVs that have off-vehicle charge capability are considered plug-in FCEVs, not FCEVs.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define a zero emission vehicle technologies that would be produced and delivered for sale in

compliance with California Code of Regulations, title 13, sections 1961.3 and 1962.4, and certified by these test procedures.

"Fuel-fired heater"

Purpose:

The purpose of this definition is to define a fuel burning device that creates heat for the purpose of warming the passenger compartment of a vehicle but does not contribute to the propulsion of the vehicle. ZEVs with fuel-fired heaters do not qualify for vehicle values under section 1962.4, title 13, CCR.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define because ZEVs with fuel-fired heaters maybe certified in California, but may not count toward California Code of Regulations, title 13, section 1962.4.

"Full state-of-charge (SOC)"

Purpose:

The purpose of this definition is to define the battery of a BEV, plug-in hybrid electric vehicle, or plug-in FCEV is at its maximum level of charge following a recharging event with an off-vehicle charger.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define as it is a required parameter that must be met when testing ZEVs and plug-in hybrid electric vehicles.

"Highway All-Electric Range"

Purpose:

The purpose of this definition is to define the AER determined with an all-electric range test using the Highway Fuel Economy Driving Schedule.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define because this value is factored into calculation of manufacturer's certified all-electric range which is used to determine qualification under California Code of Regulations, title 13, section 1962.4.

"Highway Fuel Economy Driving Schedule" or "HFEDS"

Purpose:

The purpose of this definition is to define the highway fuel economy driving schedule as specified in 40 CFR §600.109(b).

Rationale:

This definition is necessary to include as it defines the test cycle used to demonstrate PHEV emission compliance with highway emission standards. This definition is also necessary since the HFEDS test cycle is used in the Continuous Highway Test Schedule to determine the highway all-electric range.

"Normal Mode"

Purpose:

The purpose of this definition is to define the operating mode where the vehicle automatically optimizes powertrain and braking operation for the most common driving conditions as determined by the manufacturer. Normal mode would be equivalent to default mode if the vehicle has default mode.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define the operating mode by which plug-in hybrid electric vehicles must be tested in if the vehicle does not have a default mode.

"Off-Vehicle Charge Capable"

Purpose:

The purpose of this definition is to define vehicles having the capability to charge a battery from an off-vehicle electric energy source that cannot be connected or coupled to the vehicle in any manner while the vehicle is being driven.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to include, as it is used in the definition of plug-in hybrid electric vehicles and plug-in fuel cell vehicle.

"Plug-in Hybrid Electric Vehicle (PHEV)"

Purpose:

The purpose of this definition is to define any vehicle that is off-vehicle charge capable, that is not a zero-emission vehicle, and that can draw propulsion energy from both of the following on-vehicle sources of stored energy: 1) a consumable fuel and 2) an energy storage device such as a battery, capacitor, or flywheel.

Rationale:

This definition is necessary to define a vehicle technology that would be produced and delivered for sale in compliance with California Code of Regulations, title 13, sections 1961.3, 1961.4, and 1962.4, and certified by these test procedures.

"Plug-In Fuel Cell Electric Vehicle"

Purpose:

The purpose of this definition is to define any fuel-cell electric vehicle that is off-vehicle charge capable.

Rationale:

This definition is necessary to define a zero-emission vehicle technology that would be produced and delivered for sale in compliance with California Code of Regulations, title 13, sections 1961.3, and 1962.4, and certified by these test procedures.

"Regenerative braking"

Purpose:

The purpose of this definition is to define the partial recovery of the energy normally dissipated into friction braking that is returned as electrical current to an energy storage device.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to include as it is a functionality of many ZEVs and plug-in hybrid electric vehicles.

"Run-Out"

Purpose:

The purpose of this definition is to define the point at which the pressure in the vehicle's on-board hydrogen tank(s) no longer allows vehicle operation on a 65 miles per hour constant speed cycle within the speed tolerances specified in 40 CFR § 1066.425(b) for performing emission tests with exhaust measurements.

Rationale:

This term is necessary to be included for the calculation of unusable fuel amount in SAE J2572.

"SAE J1634"

Purpose:

The purpose of this definition is to describe the acronym SAE J1634 as meaning SAE International "Battery Electric Vehicle Energy Consumption and Range Test Procedure," April 2021.

Rationale:

This definition is necessary to explain what SAE J1634 means, including the date of the correct document, as this is a test procedure manufacturers are to follow for range testing battery electric vehicles.

"SAE J1711"

Purpose:

The purpose of this definition is describe the acronym SAE J1711 as meaning SAE International "Recommended Practice for Measuring the Exhaust Emissions and Fuel Economy of Hybrid-Electric Vehicles, Including Plug-in Hybrid Vehicles," June 2010.

Rationale:

This definition is necessary to explain what SAE J1711 means, including the date of the correct document, as this is a test procedure manufacturers are to follow for electric range testing plug-in hybrid electric vehicles.

"SAE J2572"

Purpose:

The purpose of this definition is to describe the acronym SAE J2572 as meaning SAE International "Recommended Practice for Measuring Fuel Consumption and Range of Fuel Cell and Hybrid Fuel Cell Vehicles Fueled by Compressed Gaseous Hydrogen," October 2014.

Rationale:

This definition is necessary to explain what SAE J2572 means, including the date of the correct document, as this is a test procedure manufacturers are to follow for electric range testing fuel cell electric vehicles.

"SC03"

Purpose:

The purpose of this definition is to define the U.S. EPA SC03 driving schedule representing vehicle operation with air conditioning, as set forth in Appendix I of 40 CFR Part 86.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to include because PHEVs must complete SCO3 testing when certifying emissions.

"State-of-Charge (SOC) Net Energy Change Tolerance"

Purpose:

The purpose of this definition is to define the state-of-charge net energy change tolerance that is applied to the SOC Criterion for charge-sustaining plug-in hybrid electric vehicles when validating an emission test.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define as it is used throughout the calculation of PHEV electric range.

"State-of-Charge (SOC) Criterion"

Purpose:

The purpose of this definition is to define the criteria applied to a charge-sustaining plug-in hybrid electric vehicle to validate an emission test and requires that no net change in battery energy occurs over a given test cycle, i.e., the final battery state-of-charge that is recorded at the end of the emission test must be equivalent to the initial battery state-of-charge that is set at the beginning of the emission test.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define as it is used to validate PHEV emission tests.

"UDDS"

Purpose:

The purpose of this definition is to describe what the acronym UDDS as meaning urban dynamometer driving schedule as set forth in Appendix I of 40 CFR Part 86.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty

Truck And Medium-Duty Vehicle Classes", and is necessary to define an acronym used throughout the test procedures, as it is a common drive schedule for emission and range testing.

"Urban All-Electric Range"

Purpose:

The purpose of this definition is to define the all-electric range determined with an all-electric range test using the UDDS.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define because this value is factored into calculation of manufacturer's certified all-electric range which is used to determine qualification under California Code of Regulations, title 13, section 1962.4.

"US06"

Purpose:

The purpose of this definition is to describe what the acronym US06 a meaning US06 driving schedule as set forth in Appendix I of 40 CFR Part 86.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define because this value is a minimum requirement for plug-in hybrids to qualify to count towards a manufacturer's compliance with California Code of Regulations, title 13, section 1962.4.

"Zero-emission vehicle (ZEV)"

Purpose:

The purpose of this definition is to define a vehicle that produces zero exhaust emissions of any criteria pollutant (or precursor pollutant) or greenhouse gas excluding emissions from air conditioning systems, under any possible operational

modes or conditions. The definition also gives examples of zero emission vehicles as BEVs, FCEVs, and plug-in FCEVs.

Rationale:

This definition is included in the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes", and is necessary to define the technology which is centered in California Code of Regulations, title 13, section 1962.4.

Section C. Test Procedures for 2026 and Subsequent Model Year Zero-Emission Vehicles

Subsection 1. Electric Dynamometer.

Purpose:

The purpose of this subsection is to make explicit that ZEVs must be test using an electric dynamometer that meets the requirements of Code of Federal Regulations, Title 40, Part 1066, Subpart C.

Rationale:

This subsection is necessary to ensure all testing performed is using a valid electric dynamometer, a testing machine used in vehicle certification, emission testing, and range testing. This requirement mimics the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes" for ZEV range testing.

Subsection 2. Vehicle and Battery Break-In Period.

Purpose:

The purpose of this subsection is to require the vehicle to be stabilized, according to good engineering judgement of the manufacturer.

Rationale:

This subsection is necessary to ensure the vehicle test results are valid and representative of range and energy consumption for a new vehicle.

Subsection 3. Operating Mode for Testing.

Purpose:

The purpose of this subsection is to require vehicles to be tested in their default mode, and in the cases that a vehicle does not have a default mode, in the normal mode.

Rationale:

Manufacturers add programming to vehicles to allow drivers user-selectable modes which vary the vehicle operation. This could increase the performance of the vehicle, or a mode to encourage slower accelerations and more regenerative braking. This requirement ensures testing is done according to the default mode. This requirement mimics the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes" for ZEV range testing.

Subsections 4 through 4.3 SAE J1634 Test Procedures.

Purpose:

The purpose of subsection C.4 is to specify how BEVs are to complete range testing, according to SAE J1634. Subsection 4.1 allows manufacturers to use any of the testing methods in SAE J1634, and makes explicit the Executive Officer may use any of the four options when performing confirmatory, in-use compliance, or other enforcement testing. Subsection 4.2 requires manufacturers to disclose the constant discharge rate as well as the distance and or time the vehicle was operated for the constant speed cycle portion of the test. Subsection 4.3 prohibits thermal condition during the vehicle soak time, prior to vehicle charging and testing, but allows for thermal conditioning during charging if that is part of the default mode or normal mode of the vehicle.

Rationale:

These subsections are necessary for specifying how BEVs are to complete range testing, which is a necessary part of certifying the vehicle and complying with California Code of Regulations, title 13, section 1962.4. Subsections 4.1 through 4.3 are necessary for modifying SAE J1634 to ensure range values accurately reflect vehicle range at the time of certification.

Subsections 5 through 5.2. SAE J2572 Test Procedures.

Purpose:

The purpose of subsection C.5 is to specify how FCEVs are to complete range testing, according to SAE J1634. Subsection 5.2 specifies that manufacturers are to use the definition contained in the test procedures for "run out" when determining the unusable fuel amount.

Rationale:

These subsections are necessary for specifying how FCEVs are to complete range testing, which is a necessary part of certifying the vehicle and complying with California Code of Regulations, title 13, section 1962.4. Subsections 5.1 through 5.2 are necessary for modifying SAE J2572 to ensure range values accurately reflect vehicle range at the time of certification.

Subsection 5.3

Purpose:

The purpose of subsection 5.3 is to allow a certification option for plug-in FCEVs through Executive Officer approval.

Rationale:

This subsection is necessary in the case where a plug-in FCEV is produced and delivered for sale. Currently none exist for sale today, and there is no certification path that would adequately test this type of vehicle. These subsections are necessary for specifying how plug-in FCEVs are to complete range testing, which is a necessary

part of certifying the vehicle and complying with California Code of Regulations, title 13, section 1962.4.

Subsection 6. through 6.3. Required Testing.

Purpose:

The purpose of subsections 6 through 6.3 is to require specific parameters to be tested on zero emission vehicles such as cycle specific range values and energy consumption, useable energy, and useable amount of fuel.

Rationale:

These subsections are necessary to specify vehicle testing requirements for zero emission vehicles.

Subsection 7. Determination of Battery Specific Energy for ZEVs.

Purpose:

This subsection is necessary to make explicit how manufacturers are to determine battery specific energy for BEVs.

Rationale

This subsection is necessary to explain how manufacturers are to test for the battery specific energy for ZEVs. This requirement mimics the current test procedure titled "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

Subsection 8. Determination of the Emissions of the Fuel-fired Heater for ZEVs.

Purpose:

The purpose of this subsection is to explain how manufacturers are complete emission certification testing for ZEVs with fuel fired heaters and lay out a calculation to obtain a grams per mile value.

Rationale:

This subsection is necessary to make explicit parameters for determining emissions for ZEVs with fuel fired heaters.

Section D.

Purpose: This is a blank section.

Rationale: This section is blank for formatting purposes.

Section E. TEST PROCEDURES FOR 2026 AND SUBSEQUENT MODEL PLUG-IN HYBRID ELECTRIC VEHICLES.

BACKGROUND.

Purpose: The purpose of this section is to define the exact version of the 40 CFR Part 1066 regulations that are referenced in this document.

Rationale: It is necessary to define which version of 40 CFR Part 1066 is referenced since different version can have different provisions and requirements and it is necessary to ensure that the correct version with the correct provisions and requirements is used.

1. TEST EQUIPMENT AND RECORDING REQUIREMENTS.

1.1 Dynamometer Equipment for Testing.

Purpose: The purpose of this subsection is to define the dynamometer equipment specifications for PHEV testing.

Rationale: This subsection is equivalent to the current test procedure section G.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

1.2 Data Recording Requirements.

Purpose: This subsection defines the data parameters that need to be recorded during PHEV testing and charging.

Rationale: This subsection is equivalent to the current test procedure subsection G.3.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

1.3 Measurements Accuracy.

Purpose: The purpose of this subsection is to define the required measurement accuracy of the equipment used to measure voltage and current signals from a PHEV during a test.

Rationale: It is needed to specify the measurement accuracy of the voltage and current measurement equipment to ensure standardized equipment is used that will give reliable measurements. To reduce testing burden, alternative measurement methods are allowed if shown to yield equivalent results.

1.4 Watt-Hour Calculation.

Purpose: This subsection defines how to calculate the DC and AC energy.

Rationale: This subsection is equivalent to the current test procedure subsection G.3.4 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

1.5 Charging Equipment Requirements.

Purpose: This subsection outlines the requirements for the charging equipment needed to charge a PHEV before and after testing.

Rationale: This subsection is identical to the current test procedure subsection G.3.5 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

2. ALL-ELECTRIC RANGE TESTING.

2.1 Provision for Use of Alternative Procedures

Purpose: The purpose of this subsection is to allow the use of alternative test procedures for all-electric range testing.

Rationale: It is necessary to include a provision to allow the use of alternative test procedures because unique or unforeseen situations may arise that may prevent a PHEV from being tested according to the test procedures proposed in subsections E.2.3 to E.2.6. The provision in this subsection allows CARB to review alternative test procedures on a case-by-case basis and allow use if the alternative test procedure is deemed to yield equivalent results to the test procedures in subsection E.2.3 to E.2.6.

2.2 Driver Selectable Mode for Range Testing.

Purpose: This subsection defines which driver selectable mode a PHEV shall be tested in during an all-electric range test.

Rationale: PHEVs commonly have many driver selectable modes and it is necessary to define in which specific driver selectable mode the PHEV shall be tested since different driver selectable modes can generate different all electric-range results.

2.3 Regenerative Braking.

Purpose: This subsection states that PHEVs are allowed to use regenerative braking during testing.

Rationale: This subsection is equivalent to the current test procedure subsection G.3.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

2.4 Urban All-Electric Range.

2.4.1 Urban All-Electric Range Definition.

Purpose: The purpose of this subsection is to define the start and end points of a urban all-electric range test and to specify that the normal or default driver selectable mode as a requirement for a valid all-electric range test.

Rationale: It is necessary to define the start and end points of an urban all-electric range test to ensure that the all-electric range is measured using the same start and end points for all tests. This makes it possible to compare the all-electric range between different tests and different PHEVs. Also, it is necessary to specify that the all-electric range test must be performed in normal mode or default mode since these are the modes that are predominantly used in real-world driving. Since the all-electric range test can be conducted concurrently with the Urban Charge-Depleting Emission Test, it is necessary to state that the all-electric range is valid only if the Urban Charge-Depleting Emission Test is conducted in normal or default mode.

2.4.2 Cold Soak and Vehicle Charging

Purpose: This subsection outlines the conditions for a valid vehicle soak before an urban all-electric range test.

Rationale: The soak conditions are necessary to define to ensure that all PHEVs are prepared for the test using the same procedures so that the initial condition of PHEVs

at the start of a test is the same. This helps ensure that results are more consistent and repeatable.

2.4.3 Urban Equivalent All-Electric Range Calculation.

Purpose: This subsection indicates where to find the method used to calculate the equivalent all-electric range.

Rationale: It is necessary to define a method to calculate equivalent all-electric range to ensure that all PHEVs use the same method. The equivalent all-electric range is necessary to calculate so as to be able to estimate GHG emissions during blended PHEV operation.

2.5 Highway All-Electric Range.

2.5.1 Highway All-Electric Range Definition.

Purpose: The purpose of this subsection is to define the start and end points of a highway all-electric range test.

Rationale: It is necessary to define the start and end points of a highway all-electric range test to ensure that the all-electric range is measured using the same start and end points for all tests. This makes it possible to compare the all-electric range between different tests and different PHEVs.

2.5.2 Cold Soak and Vehicle Charging

Purpose: This subsection outlines the conditions for a valid vehicle soak before a highway all-electric range test.

Rationale: The soak conditions are necessary to define to ensure that all PHEVs are prepared for the test using the same procedures so that the initial condition of PHEVs at the start of a test is the same. This helps ensure that results are more consistent and repeatable.

2.5.3 Highway Charge Depleting All-Electric Range Test.

Purpose: This subsection outlines the test procedure and end-of-test criteria for the highway all electric range test.

Rationale: Variance in test procedures and end-of-test criteria can affect the all-electric range test results. Therefore, a standardized test procedure and end-of-test criteria are defined in this subsection to ensure that PHEVs are not gaining a favorable advantage by using different test procedures or end-of-test criteria.

2.5.4 Vehicle Charging after the Highway Charge Depleting All-Electric Range Test.

Purpose: The purpose of this subsection is to outline the procedure for charging a PHEV after a highway all-electric range test.

Rationale: PHEV charging after a highway all-electric range test is necessary to calculate how much AC energy must be used to recharge the PHEV battery after the all-electric range test. Calculating the AC energy needed to recharge the PHEV battery gives an estimate of how many kilowatt-hours of AC energy per mile the PHEV consumed during the US06 All-Electric Range Test. Calculating the AC energy needed to recharge the highway all-electric range test.

2.5.5 Highway Equivalent All-Electric Range Calculation.

Purpose: This subsection indicates where to find the method used to calculate the equivalent all-electric range.

Rationale: It is necessary to define a method to calculate equivalent all-electric range to ensure that all PHEVs use the same method. The equivalent all-electric range is necessary to calculate so as to be able to estimate GHG emissions during blended PHEV operation.

2.6 US06 All-Electric Range.

2.6.1 US06 All-Electric Range Definition.

Purpose: The purpose of this subsection is to define the start and end points of a US06 All-Electric Range Test.

Rationale: It is necessary to define the start and end points of the US06 All-Electric Range Test to ensure that the all-electric range is measured using the same start and end points for all tests. This makes it possible to compare the all-electric range between different tests and different PHEVs to ensure the vehicle meets the standards.

2.6.2 Cold Soak and Vehicle Charging.

Purpose: This subsection outlines the conditions for a valid vehicle soak before a US06 All-Electric Range Test.

Rationale: The soak conditions are necessary to define to ensure that all PHEVs are prepared for the test using the same procedures so that the initial condition of PHEVs at the start of a test is the same. This helps ensure that results are more consistent and repeatable.

2.6.3 Dynamometer Run.

Purpose: This subsection outlines the test procedure and end-of-test criteria for the US06 All-Electric Range Test.

Rationale: Variance in test procedures and end-of-test criteria can affect the all-electric range test results. Therefore, a standardized test procedure and end-of-test criteria are defined in this subsection to ensure that PHEVs are not gaining a favorable advantage by using different test procedures or end-of-test criteria.

2.6.4 Vehicle Charging after the US06 All-Electric Range Test.

Purpose: The purpose of this subsection is to outline the procedure for charging a PHEV after a US06 Charge-Depleting Emission Test.

Rationale: PHEV charging after a US06 All-Electric Range Test may be necessary to calculate how much AC energy was used to recharge the PHEV battery after the test. Calculating the AC energy needed to recharge the PHEV battery gives an estimate of how many kilowatt-hours of AC energy per mile the PHEV consumed during the US06 All-Electric Range Test.

3. EMISSION TESTING GENERAL PROVISIONS.

3.1 Applicability and General Provisions

Purpose: This subsection specifies that PHEV emission tests shall follow the general provisions outlined in to 40 CFR § 1066.801.

Rationale: This provision is necessary so that California PHEV emission test provisions will be consistent with federal emission test provisions. This allows manufactures to reduce test burden by avoiding separate emission testing for California and federal vehicle certification.

3.2 Provision for Use of Alternative Procedures

3.2.1 Provision for Use of Alternative Test Procedures

Purpose: The purpose of this subsection is to allow the use of alternative test procedures for PHEV testing and to describe the process by which manufacturers may submit a request for approval.

Rationale: It is necessary to include a provision to allow the use of alternative test procedures because unique or unforeseen situations may arise that may prevent a PHEV from being tested according to the test procedures proposed in section E. The provision in this subsection allows CARB to review alternative test procedures on a

case-by-case basis and allow use if the alternative test procedure is deemed to yield equivalent emission results to the test procedures described in sections E.

3.2.2. Provision for Use of Alternative End-of-Test Criteria

Purpose: The purpose of this subsection is to describe the process by which manufacturers may submit a request for approval to use alternative end-of-test criteria.

Rationale: It is necessary to outline the process by which manufacturers can request use of alternative end-of-test procedures so that manufacturers will know how to submit the request for approval, know what is required for approval, and know when the approval must be submitted. The section also outlines the review process and the conditions to accept or reject the approval request.

3.3 Vehicle and Battery Break-In Period and Emission Stabilization.

Purpose: The purpose of this subsection is to require manufacturers to test PHEVs at a vehicle and battery break-in condition that represents stabilized emissions.

Rationale: This subsection is equivalent to the current test procedure section G.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

3.4 Vehicle Operation and Driver Selectable Mode Requirements for Worst Case Emission Testing.

3.4.1 Urban Emission Testing.

Purpose: The purpose of this subsection is to specify which driver selectable mode and vehicle operation the PHEV shall be emission tested for the urban emission test.

Rationale: PHEVs commonly have many driver selectable modes and it is necessary to define in which specific driver selectable mode the PHEV shall be emission tested since different driver selectable modes can generate different emission results. It is also necessary to specify in which vehicle operation the PHEV shall be emission tested since PHEVs have different types of vehicle operation that are not driver selectable but can affect emissions, such charge-sustaining (where the PHEV battery energy is relatively unchanged), charge-depleting (where the PHEV battery energy is being consumed), and charge-increasing (where the PHEV battery energy is being charged).

3.4.2 Alternative Urban Emission Test.

Purpose: The purpose of this subsection is to specify which driver selectable mode the PHEV shall be emission tested for the alternative urban emission test.

Rationale: PHEVs commonly have many driver selectable modes and it is necessary to define in which specific driver selectable mode the PHEV shall be emission tested since different driver selectable modes can generate different emission results.

3.4.3 Highway and SC03 Emission Testing.

Purpose: The purpose of this subsection is to specify which driver selectable mode and vehicle operation the PHEV shall be emission tested for the SC03 and highway emission tests.

Rationale: PHEVs commonly have many driver selectable modes and it is necessary to define in which specific driver selectable mode the PHEV shall be emission tested since different driver selectable modes can generate different emission results. It is also necessary to specify in which vehicle operation the PHEV shall be emission tested since PHEVs have different types of vehicle operation that are not driver selectable but can affect emissions.

3.4.4 US06 Emission Testing.

Purpose: The purpose of this subsection is to specify which driver selectable mode and vehicle operation the PHEV shall be emission tested for the US06 charge-sustaining emission test and the US06 charge-depleting emission test.

Rationale: PHEVs commonly have many driver selectable modes and it is necessary to define in which specific driver selectable mode the PHEV shall be emission tested since different driver selectable modes can generate different emission results. It is also necessary to specify in which vehicle operation the PHEV shall be emission tested since PHEVs have different types of vehicle operation that are not driver selectable but can affect emissions.

3.4.5 20°F and 50°F Urban Emission Testing.

Purpose: The purpose of this subsection is to specify which driver selectable mode and vehicle operation the PHEV shall be emission tested for the 20°F and 50°F urban emission tests.

Rationale: PHEVs commonly have many driver selectable modes and it is necessary to define in which specific driver selectable mode the PHEV shall be emission tested since different driver selectable modes can generate different emission results. It is also necessary to specify in which vehicle operation the PHEV shall be emission tested

since PHEVs have different types of vehicle operation that are not driver selectable but can affect emissions.

3.4.6 Alternative Determination of Worst Case Driver-Selectable Modes.

Purpose: This subsection allows manufacturers to determine the worst case drive selectable mode through engineering evaluation rather than conducting emission tests in every driver selectable mode.

Rationale: PHEVs can have a many different driver-selectable modes and it would be very time consuming to determine the worst case driver-selectable mode by conducting every emission test in every driver-selectable mode. Therefore, this provision reduces testing burden by allowing manufactures to use engineering data or evaluation to determine the worst case driver-selectable mode. CARB can further verify worst-case emissions through subsection E.9.1.1 that allows CARB to perform in-use and confirmatory emission testing in any driver selectable mode.

4. URBAN EMISSION TEST PROVISIONS.

4.1 Urban Test Applicability and General Provisions.

Purpose: This subsection states that urban testing is to be conducted pursuant to 40 CFR § 1066.801 with revisions that are outlined in the following sections.

Rationale:

The provision in this subsection is identical to the provision given in the current test procedure in the first paragraph in subsection G.5.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.1.1

Purpose: This subsection states that no revisions are required for subparagraphs (a) through (b).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.1.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.1.2

Purpose: This subsection outlines the revisions needed for subparagraph (c)(1).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.1.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.1.3

Purpose: This subsection outlines the test sequence of the Urban Charge-Sustaining Emission Test and the Urban Charge-Depleting Emission Test.

Rationale: This subsection is necessary to outline the test sequence differences between the Urban Charge-Sustaining Emission Test and the Urban Charge-Depleting Emission Test.

4.1.4

Purpose: This subsection states that subparagraphs (c)(1)(ii) through (c)(5) do not apply to the PHEV urban test procedure.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.1.4 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.1.5

Purpose: This subsection states that no revisions are needed for subparagraph (d).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.1.5 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.1.6

Purpose: This subsection is needed to state that no changes are needed to subparagraph (e) except the hot soak test temperature in the three-day diurnal emission test sequence is 105°F.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.1.6 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2 Urban Charge-Sustaining Emission Test.

4.2.1 Vehicle Preconditioning for Urban Charge Sustaining Emission Test.

Purpose: This subsection is needed to specify the document that is needed to reference for performing the preconditioning procedure.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.1.1

Purpose: This subsection explains the vehicle mode that is used for the vehicle preconditioning drive.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.2.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.1.2

Purpose: This subsection outlines the initial fuel drain and fill procedure.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.2.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.1.3

Purpose: This subsection outlines the soak requirements following the fuel drain and fill.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.2.3 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.1.4

Purpose: This subsection requires the vehicle to be moved to the dyno and preconditioned.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.2.4 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.1.5

Purpose: The purpose of this subsection is to define the test cycle for the preconditioning drive and to allow additional driving after the test cycle to set the initial battery state-of-charge for the subsequent emission test.

Rationale: It is necessary to define the test cycle for the preconditioning drive so that all PHEV vehicles will be prepared for the emission test in the same manner using the same test cycle. It is also needed to allow battery state-of-charge to be set after the preconditioning test cycle because it will help reduce testing burden by reducing the number of invalid tests that do not meet the end-of-test criteria outlined in subsection E.4.2.3 (i.e. SOC Net Energy Change Tolerances in section E.10). This ensure test results are valid and accurately reflect whether the vehicle meets the standards.

4.2.1.6

Purpose: This subsection outlines the fuel and drain requirements after the preconditioning drive.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.2.6 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.1.7

Purpose: This subsection outlines the soak requirements before the emission test.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.2.7 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.1.8

Purpose: The purpose of this subsection is to allow the vehicle battery to be charged or discharged during the soak period to set the initial battery state-of-charge for the subsequent emission test.

Rationale: It is necessary to allow the PHEV battery to be charged or discharged to help set the initial battery state-of-charge because it will help reduce testing burden by reducing the number of invalid tests that do not meet the end-of-test criteria outlined in subsection E.4.2.3 (i.e. SOC Net Energy Change Tolerances in section E.10).

4.2.1.8.1

Purpose: The purpose of this subsection is to prohibit setting the initial battery state-of-charge for the Alternative Urban Emission Test.

Rationale: Setting the initial battery state-of-charge during the soak period for the Alternative Urban Emission Test is prohibited because the Alternative Urban Emission Test does not need to satisfy the end-of-test criteria in subsection E.4.2.3 or the SOC Net Energy Change Tolerance in section E.10 to satisfy conditions for a valid test.

4.2.1.8.2

Purpose: The purpose of this subsection is to prohibit setting the initial battery state-of-charge for an Urban Charge-Sustaining Emission Test conducted in charge-increasing driver-selectable mode.

Rationale: Setting the initial battery state-of-charge during the soak period for an Urban Charge-Sustaining Emission Test conducted in charge-increasing driver-selectable mode is prohibited because, in most instances, such a test will need to be meet the alternative end-of-test criteria outlined in E.4.2.4.2 rather than the end-of-test criteria outlined in E.4.2.3.

4.2.1.8.3

Purpose: The purpose of this subsection is to require PHEVs testing in charge-increasing operation to set the initial SOC for the Urban Charge-Sustaining Emission Test at the lowest normal SOC level allowed by the vehicle when driving on the UDDS cycle.

Rationale: Setting the initial SOC for the Urban Charge-Sustaining Emission Test at the lowest normal SOC level allowed by the vehicle is required for PHEVs testing in charge-increasing operation because the lowest SOC level is a condition that occurs during charge-increasing operation and the provision in this subsection ensures that this condition is captured during the emission test so that the measured emissions are representative of charge-increasing operation.

4.2.2 Determination of Urban Charge-Sustaining Emissions –Dynamometer Test Run, Gaseous and Particulate Emissions.

Purpose: This subsection specifies that the Urban Charge-Sustaining Emission Test shall follow the general provisions outlined in to 40 CFR § 1066.815 with certain revisions that are outlined in the following subsections.

Rationale: This provision is necessary so that California PHEV urban emission test provisions will be consistent with federal emission test provisions. This allows manufactures to reduce test burden by avoiding separate emission testing for California and federal vehicle certification. The revisions outlined in the following subsections are necessary because PHEV testing has unique conditions, due to the ability to drive electrically, that are not considered in 40 CFR § 1066.815.

4.2.2.1 General

4.2.2.1.1.

Purpose: The purpose of this subsection is to outline the test sequence of the Urban Charge-Sustaining Emission Test and the initial battery state-of-charge conditions.

Rationale: Defining a consistent test sequence and initial battery state-of-charge conditions is necessary to ensure that all PHEVs begin the test with the same battery state-of-charge conditions and follow the same speed trace during the test.

4.2.2.2 PM Sampling

4.2.2.2.1.

Purpose: This subsection outlines the PM sampling requirements and references the appropriate CFR sections to follow.

Rationale: This subsection is equivalent to the current test procedure outlined in subsection G.5.3.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.2.2.2.

Purpose: This subsection outlines that separate PM samples may be collected for different phases of the emission test.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.3.3 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.2.2.3.

Purpose: This subsection states that no changes are needed for 40 CFR § 1066.815 subparagraph (b)(2).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.3.4 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.2.2.4.

Purpose: This subsection states that the PM provisions in 40 CFR § 1066.815 subparagraphs (b)(3) and (b)(4) do not apply to this test procedure.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.3.5 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.2.2.5.

Purpose: This subsection states that there are no changes to the PM provisions given in 40 CFR § 1066.815 subparagraph (b)(5).

Rationale: This subsection is identical to the provision in the current test procedure outlined in subsection G.5.3.6 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.2.3 Gaseous Sampling

4.2.2.3.1.

Purpose: This subsection states that there are no changes to the provisions given in 40 CFR § 1066.815 (c)(1) and (c)(2).

Rationale: This subsection is identical to the provision in the current test procedure outlined in subsection G.5.3.6 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.2.3.2.

Purpose: This subsection states that the provisions in 40 CFR § 1066.815 subparagraphs (c)(3) do not apply to this test procedure.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.3.7 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.2.4 Test Sequence

4.2.2.4.1.

Purpose: This subsection gives the required revisions for 40 CFR § 1066.815 subparagraph (d).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.3.8 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.2.4.2.

Purpose: This subsection states that there are no changes to the provisions given in 40 CFR § 1066.815 subparagraph (d)(1).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.3.9 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.2.4.3.

Purpose: This subsection gives the required revisions for 40 CFR § 1066.815 subparagraph (d)(1)(i).

Rationale: This subsection is equivalent to the provision in the current test procedure outlined in subsection G.5.3.10 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.2.4.4.

Purpose: This subsection states that there are no changes to the provisions given in 40 CFR § 1066.815 subparagraph (d)(1)(ii) and (d)(1)(iii).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.3.11 in "California Exhaust Emission Standards and Test Procedures for

2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.2.4.5.

Purpose: This subsection gives the required revisions for 40 CFR § 1066.815 subparagraph (d)(1)(iv).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.3.12 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.2.4.6.

Purpose: This subsection states that there are no changes to the provisions given in 40 CFR § 1066.815 subparagraph (d)(2).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.3.13 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.2.4.7.

Purpose: This subsection gives the required revisions for 40 CFR § 1066.815 subparagraph (d)(2)(i).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.3.14 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.2.4.8.

Purpose: This subsection gives the required revisions for 40 CFR § 1066.815 subparagraph (d)(2)(ii).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.3.15 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.2.4.9.

Purpose: This subsection gives the required revisions for 40 CFR § 1066.815 subparagraph (d)(2)(iii).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.3.16 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.3 End-of-Test Criteria.

Purpose: This subsection outlines the end-of-test criteria for a valid test.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.3.17 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.4 Alternative End-of-Test Criteria.

Purpose: This subsection introduces that alternative end-of-test criteria may be used upon approval.

Rationale: This subsection is equivalent to the current test procedure outlined in subsection G.5.3.18 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.4.1

Purpose: This subsection allows the use of an alternative end-of-test criteria that satisfies the ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.3.18.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.4.2

Purpose: This subsection allows the use of an alternative end-of-test criteria if 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.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.3.18.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.5 Urban Charge-Sustaining Gaseous Emissions Calculations.

Purpose: This subsection outlines that the gaseous emission calculations shall be conducted in accordance to 40 CFR § 1066.820 with certain revisions that are outlined in the subsequent subsections.

Rationale: This provision is necessary so that gaseous emission calculations for the urban emission test will be consistent between California and federal regulations. Using consistent methodology to calculate emissions ensures that the California urban emission standards can be directly compared to federal standards. The revisions outlined in the following subsections are necessary to provide precise terminology that specifically applies to the PHEV testing outlined in subsection E.4.2.

4.2.5.1

Purpose: This subsection states that there are no changes to the provisions given in 40 CFR § 1066.820 subparagraph (a).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.5.2.1 in the "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.5.2

Purpose: This subsection gives the equation used to calculate the composite emission value for gaseous emissions.

Rationale: This subsection is equivalent to the current test procedure outlined in subsection G.5.5.2.2 in the "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.5.3

Purpose: This subsection states that the provisions in CFR § 1066.820 subparagraph (c) do not apply to the calculation of gaseous emissions.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.5.2.3 in the "California Exhaust Emission Standards and Test

Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.6 Urban Charge-Sustaining Particulate Emissions Calculations.

Purpose: This subsection states that PM emissions are to be calculated according to 40 CFR § 1066.820 with the revisions given in the following subsections.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.6.2 in the "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.6.1

Purpose: This subsection states that the provisions in CFR § 1066.820 subparagraph (a) and (b) do not apply to the calculation of PM emissions.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.6.2.1 in the "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.6.2

Purpose: This subsection gives the equation used to calculate the composite value for PM emissions.

Rationale: This subsection is equivalent to the current test procedure outlined in subsection G.5.6.2.2 in the "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.6.3

Purpose: This subsection states that the provisions in CFR § 1066.820 subparagraph (c)(2) do not apply to the calculation of PM emissions.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.6.2.3 in the "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.2.6.4

Purpose: This subsection gives the equation used to calculate PM emissions using a combined PM mass emission value from the cold and hot start phases of the test.

Rationale: This subsection is equivalent to the current test procedure outlined in subsection G.5.6.2.4 in the "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3 Urban Charge-Depleting Emission Test.

4.3.1 Vehicle Preconditioning for Urban Charge-Depleting Emission Test.

Purpose: This subsection outlines the document that needs to be referenced to perform the vehicle preconditioning for the Urban Charge-Depleting Emission Test.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.1.1

Purpose: This subsection explains the vehicle mode that is used for the vehicle preconditioning drive.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.2.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.1.2

Purpose: This subsection outlines the initial fuel drain and fill procedure.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.2.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.1.3

Purpose: This subsection outlines the soak requirements following the fuel drain and fill.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.2.3 in "California Exhaust Emission Standards and Test Procedures for

2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.1.4

Purpose: This subsection requires the vehicle to be moved to the dyno and preconditioned.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.2.4 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.1.5

Purpose: The purpose of this subsection is to define the test cycle for the preconditioning drive.

Rationale: It is necessary to define the test cycle for the preconditioning drive so that all PHEV vehicles will be prepared for the emission test in the same manner using the same test cycle.

4.3.1.6

Purpose: This subsection outlines the fuel and drain requirements after the preconditioning drive.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.2.6 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.1.7

Purpose: This subsection outlines the soak requirements before the emission test.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.2.7 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.1.8

Purpose: The purpose of this subsection is to require PHEVs to fully charge the PHEV battery during the soak period before the start of the Urban Charge-Depleting Emission Test.

Rationale: The aim of the Urban Charge-Depleting Emission Test is to measure exhaust emission that may occur during charge-depleting operation of the PHEV. Therefore, it is necessary to charge the PHEV battery to full state-of-charge so that the Urban Charge-Depleting Emission Test will capture the full range of battery state-of-charge that may occur during real-world driving.

4.3.2 Determination of Urban Charge- Depleting Emissions –Dynamometer Test Run, Gaseous and Particulate Emissions.

Purpose: This subsection specifies that the Urban Charge-Depleting Emission Test shall follow the general provisions outlined in to 40 CFR § 1066.815 with certain revisions that are outlined in the following subsections.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.4.2 in the "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.2.1 General

4.3.2.1.1.

Purpose: The purpose of this subsection is to outline the test sequence of the Urban Charge-Depleting Emission Test and the required vehicle mode to activate.

Rationale: The three sentences in this subsection are equivalent to the first three sentences in the current test procedure in subsection G.5.4.2.1 in the "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.2.1.2.

Purpose: This subsection allows the Alternative Continuous Urban Test Schedule to be used instead of the Continuous Urban Test Schedule if a test facility is unable to perform the Continuous Urban Test Schedule.

Rationale: The sentence in this subsection is identical to the fourth sentence in the current test procedure in subsection G.5.4.2.1 in the "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.2.1.3.

Purpose: This subsection outlines the emission calculation and measurement requirements.

Rationale: The five sentences in this subsection are equivalent to the final five sentences in the current test procedure in subsection G.5.4.2.1 in the "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.2.2 PM Sampling

4.3.2.2.1.

Purpose: This subsection outlines the PM sampling requirements and references the appropriate CFR sections to follow.

Rationale: This subsection is equivalent to the current test procedure outlined in subsection G.5.4.2.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.2.2.2.

Purpose: This subsection outlines that separate PM samples may be collected for different phases of the emission test.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.4.2.3 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.2.2.3.

Purpose: This subsection states that no changes are needed for 40 CFR § 1066.815 subparagraph (b)(2).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.4.2.4 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.2.2.4.

Purpose: This subsection states that the PM provisions in 40 CFR § 1066.815 subparagraphs (b)(3) and (b)(4) do not apply to this test procedure.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.4.2.5 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.2.2.5.

Purpose: This subsection states that there are no changes to the PM provisions given in 40 CFR § 1066.815 subparagraph (b)(5).

Rationale: The provision in this subsection is equivalent to the provision in the current test procedure outlined in subsection G.5.4.2.6 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.2.3 Gaseous Sampling

4.3.2.3.1.

Purpose: This subsection states that there are no changes to the provisions given in 40 CFR § 1066.815 (c)(1) and (c)(2).

Rationale: The provision in this subsection is equivalent to the provision in the current test procedure outlined in subsection G.5.4.2.6 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.2.3.2.

Purpose: This subsection states that the provisions in 40 CFR § 1066.815 subparagraphs (c)(3) do not apply to this test procedure.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.4.2.7 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.2.4 Test Sequence

4.3.2.4.1.

Purpose: This subsection gives the required revisions for 40 CFR § 1066.815 subparagraph (d).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.4.2.8 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.2.4.2.

Purpose: This subsection states that there are no changes to the provisions given in 40 CFR § 1066.815 subparagraph (d)(1).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.4.2.9 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.2.4.3.

Purpose: This subsection gives the required revisions for 40 CFR § 1066.815 subparagraph (d)(1)(i).

Rationale: This subsection is equivalent to the current test procedure outlined in subsection G.5.4.2.10 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.2.4.4.

Purpose: This subsection states that there are no changes to the provisions given in 40 CFR § 1066.815 subparagraph (d)(1)(ii) and (d)(1)(iii).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.4.2.11 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.2.4.5.

Purpose: This subsection gives the required revisions for 40 CFR § 1 066.815 subparagraph (d)(1)(iv).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.4.2.12 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.2.4.6.

Purpose: This subsection states that there are no changes to the provisions given in 40 CFR § 1066.815 subparagraph (d)(2).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.4.2.13 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.2.4.7.

Purpose: This subsection gives the required revisions for 40 CFR § 1066.815 subparagraph (d)(2)(i).

Rationale: This subsection is equivalent to the current test procedure outlined in subsection G.5.4.2.14 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.2.4.8.

Purpose: This subsection gives the required revisions for 40 CFR § 1066.815 subparagraph (d)(2)(ii).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.4.2.15 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.2.4.9.

Purpose: This subsection gives the required revisions for 40 CFR § 1066.815 subparagraph (d)(2)(iii).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.4.2.16 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.3 End-of-Test Criteria.

Purpose: This subsection outlines the end-of-test criteria for a valid test.

Rationale: This subsection is equivalent to the current test procedure outlined in subsection G.5.4.2.17 in "California Exhaust Emission Standards and Test Procedures

for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.4 Alternative End-of-Test Criteria.

Purpose: This subsection introduces that alternative end-of-test criteria may be used upon approval.

Rationale: This subsection is equivalent to the current test procedure outlined in subsection G.5.4.3 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.4.1

Purpose: This subsection allows the use of alternative end-of-test criteria if the requirements in Section 3.9 or Section 3.9.1 of SAE J1711 are satisfied.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.4.3.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.4.2

Purpose: This subsection allows the use of an alternative end-of-test criteria if 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.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.4.3.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.5 Vehicle Charging After Testing.

Purpose: This subsection outlines the PHEV charging requirements after an Urban Charge-Depleting Emission Test.

Rationale: This subsection is equivalent to the current test procedure outlined in subsection G.5.4.4 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.6 Urban Charge-Depleting Gaseous Emissions Calculations.

Purpose: This subsection outlines that the gaseous emission calculations shall be conducted in accordance to 40 CFR § 1066.820 with certain revisions that are outlined in the subsequent subsections.

Rationale: This subsection is equivalent to the current test procedure outlined in subsection G.5.5.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.6.1

Purpose: This subsection states that there are no changes to the provisions given in 40 CFR § 1066.820 subparagraph (a).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.5.1.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.6.2

Purpose: This subsection gives the equation used to calculate the composite emission value for gaseous emissions.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.5.1.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.6.3

Purpose: This subsection states that the provisions in CFR § 1066.820 subparagraph (c) do not apply to the calculation of gaseous emissions.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.5.1.3 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.7 Urban Charge-Depleting Particulate Emissions Calculations.

Purpose: This subsection states that PM emissions are to be calculated according to 40 CFR § 1066.820 with the revisions given in the following subsections.

Rationale: This subsection is equivalent to the current test procedure outlined in subsection G.5.6.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.7.1

Purpose: This subsection states that the provisions in CFR § 1066.820 subparagraph (a) and (b) do not apply to the calculation of PM emissions.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.6.1.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.7.2

Purpose: This subsection gives the equation used to calculate the composite value for PM emissions.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.6.1.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.7.3

Purpose: This subsection states that the provisions in CFR § 1066.820 subparagraph (c)(2) do not apply to the calculation of PM emissions.

Rationale: This subsection is identical to the current test procedure outlined in subsection G.5.6.1.3 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.3.7.4

Purpose: This subsection gives the equation used to calculate PM emissions using a combined PM mass emission value from the cold and hot start phases of the test.

Rationale: This subsection is equivalent to the current test procedure outlined in subsection G.5.6.1.4 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.4 Partial Soak Emission Testing.

Purpose: The purpose of this subsection is to describe the test sequence of the Partial Soak Emission Test.

Rationale: It is necessary to describe the test sequence so that all PHEVs follow the same test sequence to determine partial soak emissions.

4.4.1 Vehicle Preconditioning Requirements.

Purpose: The purpose of this subsection is to require an Urban Charge-Sustaining Emission Test as a preconditioning test cycle.

Rationale: Vehicle preconditioning is required to ensure that all vehicles are prepared for the Partial Soak Emission Test in a consistent manner. Furthermore, conducting an Urban Charge-Sustaining Emission Test is necessary to determine the stabilized and hot start emissions to calculate Partial Soak Emissions as described in subsection E.4.4.7.

4.4.2 Partial Soak.

Purpose: The purpose of this subsection is to describe the requirements for a valid soak period.

Rationale: An outline of conditions for a valid soak period is necessary because soak conditions can affect emission test results.

4.4.3 Cold-Start Partial Soak Test Run.

Purpose: The purpose of this subsection is to describe required procedure for conducting the cold-start portion of the Partial Soak Test and for measuring emissions during the test.

Rationale: It is necessary to define the procedure for the cold-start portion of the Partial Soak Test and for measuring emissions during the test because different methods can lead to different emission results. The procedure outlined in this subsections will ensure that all PHEVs follow a standardized procedure to determine emissions. The required procedure follows 40 CFR § 1066.815 to be consistent with other urban emission tests while some revisions are made only to reflect the specific characteristics of the Partial Soak Test.

4.4.4 End-of-Test Criteria.

Purpose: The purpose of this subsection is to outline the end-of-test requirements to terminate a valid Cold-Start Partial Soak Test.

Rationale: Variance in end-of-test criteria can affect the emission results. Therefore, end-of-test criteria are defined in this subsection to ensure that PHEVs are not gaining a favorable advantage by using different end-of-test criteria. The end-of-test criteria defined in this section ensures that the emissions measured during the Cold-Start Partial Soak Test are representative of charge-sustaining operation and that PHEVs are not using extra battery power to reduce emissions.

4.4.5 Alternative End-of-Test Criteria.

Purpose: The purpose of this subsection is to introduce that alternative end-of-test criteria may be used, upon approval, to terminate a valid Cold-Start Partial Soak Test.

Rationale: It is necessary to allow alternative end-of-test criteria because there may be valid technical reasons that the end-of-test criteria in subsection E.4.4.4 cannot be met.

4.4.5.1

Purpose: The purpose of this subsection is to allow alternative end-of-test criteria that has a bigger tolerance than the end-of-test criteria defined in subsection E.4.4.4.

Rationale: The alternative end-of-test criteria defined in this section follows the guidance given in Appendix C of SAE J1711 to allow a bigger end-of-test tolerance to PHEVs that do not have precise enough control to consistently meet the end-of-test tolerances required by subsection E.4.4.4. This is consistent with the current test procedure for the Urban Charge-Sustaining Emission Test as described in subsection G.5.3.18.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.4.5.2

Purpose: The purpose of this subsection is to allow alternative end-of-test criteria to end a test if the battery state-of-charge at the end of a Cold-Start Partial Soak Test is larger than the battery state-of-charge at the start of a Cold-Start Partial Soak Test.

Rationale: The alternative end-of-test criteria outlined in this subsection is necessary because the Cold-Start Partial Soak Test requires PHEVs to be emission tested in the worst-case driver-selectable mode and certain driver-selectable modes, such as charge-increasing mode, will cause the battery state-of-charge to increase throughout the emission test, making it impossible to meet the end-of-test criteria outlined in subsection E.4.4.4. Therefore, an alternative end-of-test criteria is necessary to end such a test where the final battery SOC is higher than the initial SOC. The alternative

end-of-test criteria defined in this subsection is consistent with the current test procedure for the Urban Charge-Sustaining Emission Test as described in subsection G.5.3.18.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.4.6 Option to Conduct Additional Cold-Start Partial Soak Tests.

Purpose: The purpose of this subsection is to allow additional Cold-Start Partial Soak Tests to be conducted by repeating the test sequence outlined in subsections E.4.4.2 to E.4.4.5.

Rationale: Allowing additional Cold-Start Partial Soak Tests to be conducted by following subsections E.4.4.2 to E.4.4.5 will reduce testing burden by allowing the very lengthy preconditioning in subsection E.4.4.1 to be skipped if it has been already done one time.

4.4.7 Partial Soak Test Emissions Calculations.

Purpose: This subsection outlines that the gaseous emission calculations shall be conducted in accordance to 40 CFR § 1066.820 with certain revisions that are outlined in the subsequent subsections.

Rationale: This provision is necessary so that gaseous emission for the Partial Soak Emission Test will be calculated consistently. The calculation follows the standard procedure outlined in 40 CFR § 1066.820 that is used for other urban emission tests. The revisions outlined in the following subsections are necessary to provide precise terminology that specifically applies to the Partial Soak Emission Test.

4.4.7.1

Purpose: This section outlines how to determine the mas of exhaust emissions of each pollutant

Rationale: The method used to determine mass emissions follows the common method given by 40 CFR § 1066.605 that is also used for other PHEV urban emission tests while specifically referring to the pollutants for the Partial Soak Emission Test intervals given by the equation in subsection E.4.4.7.2.

4.4.7.2

Purpose: This subsection defines the equation used to calculate Partial Soak Test emissions and the terms in the equation.

Rationale: The Partial Soak Test includes several emission measurement intervals and the equation and terms in this subsection define exactly how to calculate the final composite Partial Soak Test emission value using the emissions measured from each test interval. Determining a final composite emission value is necessary to determine if a PHEV is in compliance with the Partial Soak Emission Standards.

4.4.7.3

Purpose: This subsection states that subparagraph (c) of 40 CFR § 1066.820 does not apply to the Partial Soak Test emission calculation.

Rationale: Subparagraph (c) of 40 CFR § 1066.820 defines the calculation method for particulate matter emissions. This does not apply to the Partial Soak Test because the Partial Soak Test does not measure particulate matter emissions.

4.5 Quick Drive-Away Emission Testing.

4.5.1 Vehicle Preconditioning for Quick Drive-Away Emission Test.

Purpose: The purpose of this subsection is to define the preconditioning procedure for the Quick Drive-Away Test.

Rationale: Vehicle preconditioning is required to ensure that all vehicles are prepared for the Quick Drive-Away Test in a consistent manner. The preconditioning procedures in the subsection are consistent with the preconditioning procedures outlined in subsection E.4.2.1 for the Urban Charge-Sustaining Emission Test.

4.5.2 Quick Drive-Away Test Run.

Purpose: The purpose of this subsection is to describe required procedure for conducting the cold-start portion of the Quick Drive-Away Test and for measuring emissions during the test.

Rationale: It is necessary to define the procedure for the cold-start portion of the Quick Drive-Away Test and for measuring emissions during the test because different methods can lead to different emission results. The procedure outlined in this subsection will ensure that all PHEVs follow a standardized procedure to determine emissions. The required procedure follows 40 CFR § 1066.815, which is consistent with other urban emission tests, while some revisions are made only to reflect the specific characteristics of the Quick Drive-Away Test.

4.5.3 End-of-Test Criteria.

Purpose: The purpose of this subsection is to outline the end-of-test requirements to terminate a valid Quick Drive-Away Test.

Rationale: Variance in end-of-test criteria can affect the emission results. Therefore, end-of-test criteria are defined in this subsection to ensure that PHEVs are not gaining a favorable advantage by using different end-of-test criteria. The end-of-test criteria defined in this section ensures that the emissions measured during the Quick Drive-Away Test are representative of charge-sustaining operation and that PHEVs are not using extra battery power to reduce emissions.

4.5.4 Alternative End-of-Test Criteria.

Purpose: The purpose of this subsection is to introduce that alternative end-of-test criteria may be used, upon approval, to terminate a valid Quick Drive-Away Test.

Rationale: It is necessary to allow alternative end-of-test criteria because there may be valid reasons that the end-of-test criteria in subsection E.4.5.3 cannot be met.

4.5.4.1

Purpose: The purpose of this subsection is to allow alternative end-of-test criteria that has a bigger tolerance than the end-of-test criteria defined in subsection E.4.5.3.

Rationale: The alternative end-of-test criteria defined in this section follows the guidance given in Appendix C of SAE J1711 to allow a bigger end-of-test tolerance to PHEVs that do not have precise enough control to consistently meet the end-of-test tolerances required by subsection E.4.5.3. This is consistent with the current test procedure for the Urban Charge-Sustaining Emission Test as described in subsection G.5.3.18.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.5.4.2

Purpose: The purpose of this subsection is to allow alternative end-of-test criteria to end a test if the battery state-of-charge at the end of a Quick Drive-Away Test is larger than the battery state-of-charge at the start of a Quick Drive-Away Test.

Rationale: The alternative end-of-test criteria outlined in this subsection is necessary because the Quick Drive-Away Test requires PHEVs to be emission tested in the worst-case driver-selectable mode and certain driver-selectable modes, such as charge-increasing mode, will cause the battery state-of-charge to increase throughout the emission test, making it impossible to meet the end-of-test criteria outlined in subsection E.4.5.3. Therefore, an alternative end-of-test criteria is necessary to end such a test where the final battery SOC is higher than the initial SOC. The alternative end-of-test criteria defined in this subsection is consistent with the current test

procedure for the Urban Charge-Sustaining Emission Test as described in subsection G.5.3.18.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

4.5.5 Determining Hot-Start Emissions.

Purpose: The purpose of this subsection is to require PHEVs to conduct an Urban Charge-Sustaining Emission Test to determine hot-start emissions.

Rationale: Hot-start emissions are necessary to calculate the composite Quick Drive-Away Test emissions in subsection E.4.5.6.

4.5.6 Quick Drive-Away Test Emissions Calculations.

Purpose: This subsection outlines that the gaseous emission calculations shall be conducted in accordance to 40 CFR § 1066.820 with certain revisions that are outlined in the subsequent subsections.

Rationale: This provision is necessary so that gaseous emission for the Quick Drive-Away Test will be calculated consistently. The calculation follows the standard procedure outlined in 40 CFR § 1066.820 that is used for other urban emission tests. The revisions outlined in the following subsections are necessary to provide precise terminology that specifically applies to the Quick Drive-Away Test.

4.5.6.1

Purpose: This section outlines how to determine the mass of exhaust emissions of each pollutant

Rationale: The method used to determine mass emissions follows the common method given by 40 CFR § 1066.605 that is also used for other PHEV urban emission tests while specifically referring to the pollutants for the Quick Drive-Away Test intervals given by the equation in subsection E.4.5.6.2.

4.5.6.2

Purpose: This subsection defines the equation used to calculate Quick Drive-Away Test emissions and the terms in the equation.

Rationale: The Quick Drive-Away Test includes several emission measurement intervals and the equation and terms in this subsection define exactly how to calculate the final composite Quick Drive-Away Test emission value using the emissions measured from each test interval. Determining a final composite emission value is

necessary to determine if a PHEV is in compliance with the Quick Drive-Away Emission Standards.

4.5.6.3

Purpose: This subsection states that subparagraph (c) of 40 CFR § 1066.820 does not apply to the Quick Drive-Away Test emission calculation.

Rationale: Subparagraph (c) of 40 CFR § 1066.820 defines the calculation method for particulate matter emissions. This does not apply to the Quick Drive-Away Test because the Quick Drive-Away Test does not measure particulate matter emissions.

5. ALTERNATIVE URBAN EMISSION TEST PROVISIONS.

5.1 Requirement to Qualify for the Alternative Urban Emission Test.

Purpose: This subsection outlines the requirements to qualify for an Alternative Urban Emission Test.

Rationale: This subsection is identical to the first paragraph in the current test procedure in subsection G.5.4.5 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

5.2 Dynamometer Run to Determine Urban All-Electric Range for Vehicles that Qualify for the Alternative Urban Emission Test.

Purpose: This subsection is necessary to clarify that subparagraphs E.5.2.1 and E.5.2.2 must be performed during the initial Alternative Urban Emission Test to determine urban all-electric range but that these sections may be omitted during any subsequent Alternative Urban Emission Tests.

Rationale: This subsection is identical to the second paragraph in the current test procedure in subsection G.5.4.5 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

5.2.1

Purpose: This subsection is necessary to require PHEVs to be charged to a full state-of-charge before the initial Alternative Urban Emission Test.

Rationale: This subsection is identical to the current test procedure in subsection G.5.4.5 (i) in "California Exhaust Emission Standards and Test Procedures for 2018

through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

5.2.2

Purpose: This subsection outlines how to determine the all-electric range during an Alternative Urban Emission Test and specifies when emissions must be measured.

Rationale: This subsection is equivalent to the current test procedure in subsection G.5.4.5 (ii) in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

5.3 Vehicle Preconditioning.

Purpose: This subsection outlines the PHEV preconditioning procedure for the Alternative Urban Emission Test.

Rationale: The Alternative Urban Emission Test provisions in this subsection are equivalent to the Alternative Urban Emission Test provisions given in the current test procedure in subsection G.5.4.5 (iii) and the G.5.2.8 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

5.4 Determination of Alternative Urban Test Emissions – Dynamometer Test Run, Gaseous and Particulate Emissions.

5.4.1

Purpose: This subsection outlines the SOC requirement at the start of the Alternative Urban Emission Test.

Rationale: This subsection is equivalent to the current test procedure in subsection G.5.4.5 (iv) in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

5.4.2

Purpose: This subsection outlines the test sequence for the Alternative Urban Emission Test.

Rationale: This subsection is equivalent to the current test procedure in subsection G.5.4.5 (v) in "California Exhaust Emission Standards and Test Procedures for 2018

through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

5.5 Optional Vehicle Charging After Testing.

Purpose: This subsection gives the PHEV charging requirements after completion of the Alternative Urban Emission Test.

Rationale: This subsection is equivalent to the current test procedure in subsection G.5.4.5 (vii) in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

5.6 Alternative Urban Test Emissions Calculations.

Purpose: This subsection is necessary to reference the appropriate sections to follow to calculate emissions for the Alternative Urban Emission Test.

Rationale: This subsection is equivalent to the current test procedure in subsection G.5.4.5 (vi) in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

6. HIGHWAY EMISSION TEST PROVISIONS.

6.1 Highway Emission Test.

Purpose: This subsection specifies that the highway emission test shall follow the general provisions outlined in to 40 CFR § 1066.840 with certain revisions that are outlined in the following subsections.

Rationale: This subsection is identical to the current test procedure in subsection G.6.1.4 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

6.2 Vehicle Preconditioning and Emission Testing.

6.2.1

Purpose: This subsection gives the required revisions for 40 CFR § 1066.840 subparagraph (a).

Rationale: This subsection is identical to the current test procedure in subsection G.6.1.4.1 in "California Exhaust Emission Standards and Test Procedures for 2018

through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

6.2.2

Purpose: This subsection gives the required revisions for 40 CFR § 1066.840 subparagraph (b).

Rationale: The provisions in this subsection are identical to the provisions given in the current test procedures in the first five sentences in subsection G.6.1.4.2 in the "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

6.2.3

Purpose: This subsection gives the required revisions for 40 CFR § 1066.840 subparagraph (c).

Rationale: This subsection is identical to the current test procedure in subsection G.6.1.4.3 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

6.3 End-of-Test Criteria.

Purpose: This subsection outlines the end-of-test criteria for a valid test.

Rationale: The end-of-test criteria given in this subsection are equivalent to the end-of-test criteria given in the current test procedure in subsection G.6.1.4.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

6.4 Alternative End-of-Test Criteria.

Purpose: This subsection introduces that alternative end-of-test criteria may be used upon approval.

Rationale: This subsection is equivalent to the current test procedure in subsection G.6.1.5 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

6.4.1

Purpose: This subsection allows the use of an alternative end-of-test criteria that satisfies the ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711.

Rationale: This subsection is identical to the current test procedure in subsection G.6.1.5.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

6.4.2

Purpose: This subsection allows the use of an alternative end-of-test criteria 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.

Rationale: This subsection is identical to the current test procedure in subsection G.6.1.5.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7. SFTP EMISSION TEST PROVISIONS.

7.1 US06 Charge-Sustaining Emission Test.

Purpose: This subsection specifies that the US06 Charge-Sustaining Emission Test shall follow the general provisions outlined in to 40 CFR § 1066.831 with certain revisions that are outlined in the following subsections.

Rationale: This subsection is equivalent to the current test procedure in subsection G.7.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.1.1 Vehicle Preconditioning and Emission Testing.

7.1.1.1

Purpose: This subsection states that there are no changes to the provisions given in 40 CFR § 1066.831 subparagraph (a) through (b)(1).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.7.1.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.1.1.2

Purpose: This subsection gives the required revisions for 40 CFR § 1066.831 subparagraph (b)(1)(i).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.7.1.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.1.1.3

Purpose: This subsection gives the required revisions for 40 CFR § 1066.831 subparagraph (b)(1)(ii).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.7.1.3 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.1.1.4

Purpose: This subsection gives the required revisions for 40 CFR § 1066.831 subparagraph (b)(1)(iii).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.7.1.4 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.1.1.5

Purpose: This subsection states that there are no changes to the provisions given in 40 CFR § 1066.831 subparagraph (b)(2) through (b)(3)(i).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.7.1.5 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.1.1.6

Purpose: This subsection gives the required revisions for 40 CFR § 1066.831 subparagraph (b)(3)(ii).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.7.1.6 in "California Exhaust Emission Standards and Test Procedures for

2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.1.1.7

Purpose: This subsection states that there are no changes to the provisions given in 40 CFR § 1066.831 subparagraph (b)(3)(ii)(A) through (b)(3)(ii)(B).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.7.1.7 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.1.1.8

Purpose: This subsection gives the required revisions for 40 CFR § 1066.831 subparagraph (b)(3)(ii)(C).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.7.1.8 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.1.1.9

Purpose: This subsection states that there are no changes to the provisions given in 40 CFR § 1066.831 subparagraph (b)(3)(ii)(D) through (e).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.7.1.9 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.1.1.10

Purpose: This subsection gives the required revisions for 40 CFR § 1066.831 subparagraph (e)(1).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.7.1.10 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.1.1.11

Purpose: This subsection states that there are no changes to the provisions given in 40 CFR § 1066.831 subparagraph (e)(2) through (e)(2)(iii).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.7.1.11 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.1.1.12

Purpose: This subsection gives the required revisions for 40 CFR § 1066.831 subparagraph (e)(3).

Rationale: This provisions given in this subsection are identical to provisions given in the current test procedure in the first three sentences in subsection G.7.1.12 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.1.1.13

Purpose: This subsection states that there are no changes to the provisions given in 40 CFR § 1066.831 subparagraph (e)(4).

Rationale: This subsection is identical to the current test procedure outlined in subsection G.7.1.13 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.1.2 End-of-Test Criteria.

Purpose: This subsection outlines the end-of-test criteria for a valid test.

Rationale: The end-of-test criteria given in this subsection are equivalent to the end-of-test criteria given in the current test procedure in subsection G.7.1.12 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.1.3 Alternative End-of-Test Criteria.

Purpose: This subsection introduces that alternative end-of-test criteria may be used upon approval.

Rationale: This subsection is equivalent to the current test procedure in subsection G.7.1.14 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.1.3.1

Purpose: This subsection allows the use of an alternative end-of-test criteria that satisfies the ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711.

Rationale: This subsection is identical to the current test procedure in subsection G.7.1.14.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.1.3.2

Purpose: This subsection allows the use of an alternative end-of-test criteria 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.

Rationale: This subsection is identical to the current test procedure in subsection G.7.1.14.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.2 US06 Charge-Depleting Emission Test.

7.2.1 Vehicle Preconditioning for US06 Charge-Depleting Emission Test.

7.2.1.1

Purpose: The purpose of this subsection is to define the vehicle operation and driver-selectable mode for the preconditioning drive for the US06 Charge-Depleting Emission Test.

Rationale: It is necessary to define the vehicle operation and driver-selectable mode for the preconditioning drive to ensure that all PHEVs are prepared for the emission test in the same manner. Consistent preconditioning procedures reduce test variability and improve test result repeatability.

7.2.1.2

Purpose: The purpose of this subsection is to provide a reference to the preconditioning procedure that shall be followed for the US06 Charge-Depleting Emission Test.

Rationale: It is necessary to define vehicle preconditioning procedures to ensure that all vehicles are prepared for the emission test in a consistent manner that will reduce test variability and improve test result repeatability. The preconditioning procedures for the US06 Charge-Depleting Emission Test in this subsection are consistent with the preconditioning procedures outlined in subsection E.4.3.1 for the Urban Charge-Depleting Emission Test.

7.2.2 Determination of US06 Charge-Depleting Emissions –Dynamometer Test Run, Gaseous Emissions.

7.2.2.1

Purpose: The purpose of this subsection is to define the test schedule that will be used to conduct the US06 Charge-Depleting Emission Test.

Rationale: It is necessary to define a test schedule for the US06 Charge-Depleting Emission Test so that all PHEVs will follow the same speed trace during the emission test.

7.2.2.2

Purpose: This subsection requires emissions to be measured for all test cycles when the engine is operating and allows an exception to not require emission sampling for each test cycle during which emissions are not generated.

Rationale: It is necessary to collect emission samples for all test cycles when the engine is operating to ensure that the measured emissions are representative of US06 charge-depleting operation. Not requiring emission sampling for each test cycle during which emissions are not generated helps reduce testing burden without affecting emission test results.

7.2.2.3

Purpose: This subsection states that PM sampling is not required.

Rationale: PM sampling is not required because the US06 Charge-Depleting Emission Test is used to certify compliance with the PHEV High Power Cold-Start Emission Standards, which do not require PM emissions to be certified.

7.2.2.4

Purpose: This subsection requires the PHEV to be placed or pushed onto a dynamometer.

Rationale: This is necessary because the US06 Charge-Depleting Emission Test must be conducted on a dynamometer.

7.2.2.5

Purpose: This subsection requires the PHEV to be placed in default or normal mode, to be placed in gear, and to simultaneously start emission sampling and recording. It also requires the first acceleration to begin 5 seconds after placing the vehicle in gear and activating the normal or default mode.

Rationale: The PHEV is required to be in default or normal mode at the start of the emission test because these are the modes in which a PHEV will typically start driving in real-world operation. The PHEV must be placed in gear so that it can be ready to follow the required speed trace. Emission sampling and recording is required to start simultaneously with placing the PHEV in gear and activating the normal or default mode to ensure that any emissions released during the vehicle start are captured. The US06 speed trace requires the first acceleration to begin 5 seconds after starting the emission test.

7.2.2.6

Purpose: The purpose of this subsection is to define the test schedule of the US06 Charge-Depleting Emission Test and to define the end point of the test.

Rationale: It is necessary to define the test schedule for the US06 Charge-Depleting Emission Test so that all PHEVs will follow the same speed trace during the emission test. Since the US06 Charge-Depleting Emission Test follows the Continuous US06 Test Schedule, which is a continuous series of repeating US06 cycles, it is necessary to define an end point to terminate the continuous test.

7.2.2.7

Purpose: The purpose of this subsection is to explain that the end of cold-start US06 cycle completes the US06 Charge-Depleting Emission Test and satisfying the SOC Net Energy Change Tolerance criteria is not required for a valid test.

Rationale: It is necessary to state that satisfying the SOC Net Energy Change Tolerance criteria is not required for a valid US06 Charge-Depleting Emission Test because this is a common requirement for other PHEV emission tests. Using SOC Net Energy Change Tolerance as end-of-test criteria is only required for emission tests that require charge-sustaining operation to terminate the test. Therefore, SOC Net Energy

Change Tolerance do not apply to the US06 Charge-Depleting Emission Test since this test only collects cold-start emissions during charge-depleting operation to demonstrate compliance with the PHEV High Power Cold-Start Emission Standards that are based solely on charge-depleting cold-start emissions.

7.2.2.8

Purpose: The provisions in this subsection outline time limits for turning off the PHEV at the end of the test and for stopping emission sampling and recording.

Rationale: Variations in turning off the PHEV and stopping emission sampling and recording may affect the emission measurement results. Therefore, it is necessary to provide time limits to turn the vehicle off and to stop emission sampling and recording at the end of the test to reduce emission measurement variations and to improve repeatability of the emission test results.

7.2.3 Vehicle Charging After Testing.

Purpose: The purpose of this subsection is to outline the procedure for charging a PHEV after a US06 Charge-Depleting Emission Test.

Rationale: PHEV charging after a US06 Charge-Depleting Emission Test may be necessary to calculate how much AC energy was used to recharge the PHEV battery after the test. Calculating the AC energy needed to recharge the PHEV battery gives an estimate of how many kilowatt-hours of AC energy per mile the PHEV consumed during the US06 Charge-Depleting Emission Test.

7.3 SC03 Emission Test.

Purpose: This subsection requires the SC03 Emission Test to be conducted pursuant to 40 CFR § 1066.835 with the revisions given in the following subsections.

Rationale: This subsection is identical to the current test procedure in subsection G.7.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.3.1 Vehicle Preconditioning and Emission Testing.

7.3.1.1

Purpose: This subsection states that there are no changes to the provisions given in 40 CFR § 1066.835 subparagraph (a) through (c)(4).

Rationale: This subsection is identical to the current test procedure in subsection G.7.2.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.3.1.2

Purpose: This subsection gives the required revisions for 40 CFR § 1066.835 subparagraph (c)(5).

Rationale: This subsection is identical to the current test procedure in subsection G.7.2.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.3.1.3

Purpose: This subsection states that there are no changes to the provisions given in 40 CFR § 1066.835 subparagraph (c)(6) through (d).

Rationale: This subsection is identical to the current test procedure in subsection G.7.2.3 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.3.1.4

Purpose: This subsection gives the required revisions for 40 CFR § 1066.835 subparagraph (d)(1).

Rationale: This subsection is identical to the current test procedure in subsection G.7.2.4 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.3.1.5

Purpose: This subsection gives the required revisions for 40 CFR § 1066.835 subparagraph (d)(2).

Rationale: This provisions in this subsection are identical to the provisions given in the current test procedure in the first four sentences in subsection G.7.2.5 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.3.1.6

Purpose: This subsection states that there are no changes to the provisions given in 40 CFR § 1066.835 subparagraph (d)(3) through (f)(3)(iv).

Rationale: This subsection is identical to the current test procedure in subsection G.7.2.6 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.3.2 End-of-Test Criteria.

Purpose: This subsection outlines the end-of-test criteria for a valid test.

Rationale: The end-of-test criteria given in this subsection are equivalent to the end-of-test criteria given in the current test procedure in subsection G.7.2.5 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.3.3 Alternative End-of-Test Criteria.

Purpose: This subsection introduces that alternative end-of-test criteria may be used upon approval.

Rationale: This subsection is equivalent to the current test procedure in subsection G.7.2.7 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.3.3.1

Purpose: This subsection allows the use of an alternative end-of-test criteria that satisfies the ±5% SOC Net Energy Change Tolerance in Appendix C of SAE J1711.

Rationale: This subsection is identical to the current test procedure in subsection G.7.2.7.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

7.3.3.2

Purpose: This subsection allows the use of an alternative end-of-test criteria 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.

Rationale: This subsection is identical to the current test procedure in subsection G.7.2.7.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

8. 50°F AND 20°F EMISSION TEST PROVISIONS.

8.1 50°F and 20°F Emission Test.

8.1.1

Purpose: This subsection outlines the test sequence for the 50°F Emission Test.

Rationale: The provisions in this subsection are equivalent to the provisions given in the current test procedure in the first paragraph in section G.8 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

8.1.2

Purpose: This subsection outlines the test sequence for the 20°F Emission Test.

Rationale: The provisions in this subsection are equivalent to the provisions given in the current test procedure in the second paragraph in section G.8 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

8.2 Revisions for 50°F and 20°F Testing.

8.2.1 Vehicle Charging

Purpose: This subsection outlines the permitted vehicle charging before the 50°F and 20°F emission tests.

Rationale: The provisions in this subsection are equivalent to the provisions given in the current test procedure in the third paragraph in section G.8 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

8.2.2 SOC Net Energy Change Tolerances.

Purpose: This subsection specifies that vehicles are not required to meet SOC net energy change tolerances for 50°F and 20°F emission tests.

Rationale: The provision in this subsection is identical to the provision given in the current test procedure in the third sentence in section G.8.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

8.2.3 50°F and 20°F Charge-Depleting Emission Test.

Purpose: This subsection outlines the requirements for a charge-depleting emission test at 50°F and 20°F.

Rationale: This subsection is equivalent to the current test procedure subsection G.8.3 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

8.2.4 50°F and 20°F Charge-Sustaining Emission Test.

Purpose: This subsection introduces the requirements for a charge-sustaining emission test at 50°F and 20°F.

Rationale: This subsection is identical to the current test procedure subsection G.8.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

8.2.4.1

Purpose: This subsection outlines how to calculate a composite emission value for a three phase test.

Rationale: This subsection is identical to the current test procedure subsection G.8.2 (i) in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

8.2.4.2

Purpose: This subsection outlines how to calculate a composite emission value for a two phase test.

Rationale: This subsection is equivalent to the current test procedure subsection G.8.2 (ii) in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

8.2.5 50°F and 20°F Alternative Urban Emission Test.

Purpose: This subsection specifies how to conduct an Urban Alternative Emission Test at 50°F and 20°F.

Rationale: The provision in this subsection is identical to the provision given in the current test procedure in the last sentence in section G.8.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

9. CONFIRMATORY AND IN-USE COMPLIANCE TESTING.

9.1 Testing Provisions.

9.1.1 Driver Selectable Modes.

Purpose: The purpose of this subsection is to allow CARB to perform confirmatory or in-use compliance testing in any driver-selectable mode to ensure compliance with emission standards.

Rationale: PHEVs generally have many different driver-selectable modes and automakers are required to meet emission standards in every driver-selectable mode for most PHEV emission tests. Therefore, it is necessary to allow CARB to perform confirmatory or in-use compliance testing in any driver-selectable mode to verify compliance with emission standards.

9.1.2 Vehicle Operation.

9.1.2.1

Purpose: This subsection specifies which vehicle operation conditions may be used for confirmatory testing or in-use compliance testing of an urban emission test.

Rationale: The provision in this subsection is equivalent to the provision given in the current test procedure in the first sentence of the seventh paragraph in the intro in section G.5 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

9.1.2.2

Purpose: This subsection specifies which vehicle operation conditions may be used for confirmatory testing or in-use compliance testing of Highway, US06 Charge-Sustaining and SC03 emission tests.

Rationale: The provision in this subsection combines the provisions given in the current test procedure in the last paragraph of the intro in section G.6 and the last paragraph of the intro in section G.7 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

9.1.2.3

Purpose: The purpose of this section is to require confirmatory or in-use compliance testing to be done in charge-depleting operation for the US06 Charge-Depleting Emission Test.

Rationale: The US06 Charge-Depleting Emission Test is used to demonstrate compliance with the PHEV High Power Cold-Start Emission Standards. Since real-world high power cold-start emission only occur in charge-depleting operation, confirmatory testing or in-use compliance testing for the US06 Charge-Depleting Emission Test is also limited to charge-depleting operation.

9.1.2.4

Purpose: This subsection specifies the vehicle operation conditions that may be used for confirmatory testing or in-use compliance testing of an Alternative Urban Emission Test.

Rationale: The provision in this subsection is equivalent to the provision given in the current test procedure in the second sentence of the seventh paragraph in the intro in section G.5 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

9.1.2.5

Purpose: The purpose of this section is to require confirmatory or in-use compliance testing to be done in charge-sustaining operation for the Partial Soak Emission Test and the Quick Drive-Away Emission Test.

Rationale: The Partial Soak Emission Test and the Quick Drive-Away Emission Test only need to demonstrate emission compliance in charge-sustaining operation because PHEVs will typically not exhibit any partial soak or quick drive-away emissions in charge-depleting operation, while charge-increasing operation after partial soaks and during quick drive-aways in unlikely to occur in real-world driving. Therefore, confirmatory or in-use compliance testing is also limited to charge-sustaining operation.

9.1.3 SOC Provisions.

Purpose: This subsection is needed to specify that confirmatory testing or in-use compliance testing may be performed on all tests to establish if higher emissions occur at different states-of-charge in charge-depleting mode.

Rationale: This subsection is identical to the current test procedure subsection G.9.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

9.2 Urban Charge-Depleting Emission Test.

Purpose: This subsection provides emission test sequence and end-of-test requirements for confirmatory testing or in-use compliance testing of the Urban Charge-Depleting Emission Test.

Rationale: This provisions in this subsection are equivalent to the provisions given in the current test procedure in the eighth paragraph in the intro in section G.5 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

9.3 Alternative Urban Emission Test.

Purpose: This subsection outlines the emission test sequence requirements for confirmatory testing or in-use compliance testing of the Alternative Urban Emission Test.

Rationale: This provisions in this subsection are equivalent to the provisions given in the current test procedure in the last paragraph in the intro in section G.5 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

10. STATE-OF-CHARGE NET ENERGY CHANGE TOLERANCES.

10.1 General Provisions.

Purpose: This subsection allows PHEVs to abort a drive cycle if the SOC Net Energy Change tolerance is met for the previous drive cycle.

Rationale: This subsection is identical to the current test procedure subsection G.9.4 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

10.2 Vehicles That Use a Battery as an Energy Storage Device.

Purpose: This subsection is needed to provide the equations that are used to calculate state-of-charge net energy change tolerances for vehicles that use a battery as an energy storage device.

Rationale: This subsection is equivalent to the current test procedure subsection G.10.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

10.3 Vehicles That Use a Capacitor as an Energy Storage Device.

Purpose: This subsection is needed to provide the equations that are used to calculate state-of-charge net energy change tolerances for vehicles that use a capacitor as an energy storage device.

Rationale: This subsection is equivalent to the current test procedure subsection G.10.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

10.4 Vehicles That Use an Electro-Mechanical Flywheel as an Energy Storage Device.

Purpose: This subsection is needed to provide the equations that are used to calculate state-of-charge net energy change tolerances for vehicles that use an electro-mechanical flywheel as an energy storage device.

Rationale: This subsection is equivalent to the current test procedure subsection G.10.3 in "California Exhaust Emission Standards and Test Procedures for 2018

through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

11. CALCULATION OF EQUIVALENT ALL-ELECTRIC RANGE AND RELATED FORMULAS.

11.1 Equivalent All-Electric Range Formula.

11.1.1 Urban Equivalent All-Electric Range Formula.

Purpose: This subsection gives and explains the formula used to calculate Urban Equivalent All-Electric Range.

Rationale: This subsection is equivalent to the current test procedure subsection G.11.4 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

11.1.2 Urban Equivalent All-Electric Range Formula for Vehicles with Long Charge-Depleting Actual Range.

Purpose: This subsection gives and explains the formula used to calculate Urban Equivalent All-Electric Range for vehicles with an urban charge-depleting actual range greater than 40 miles.

Rationale: This subsection is equivalent to the current test procedure subsection G.11.13 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

11.1.3 Highway Equivalent All-Electric Range Formula.

Purpose: This subsection gives and explains the formula used to calculate Highway Equivalent All-Electric Range.

Rationale: This subsection is equivalent to the current test procedure subsection G.11.5 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

11.2 Equivalent All-Electric Range Energy Consumption.

11.2.1 Urban Equivalent All-Electric Range Energy Consumption.

Purpose: This subsection gives and explains the formula used to calculate Urban Equivalent All-Electric Range Energy Consumption.

Rationale: This provisions in this subsection are equivalent to the provisions in the current test procedure subsection G.11.7 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

11.2.2 Highway Equivalent All-Electric Range Energy Consumption.

Purpose: This subsection gives and explains the formula used to calculate Highway Equivalent All-Electric Range Energy Consumption.

Rationale: This provisions in this subsection are equivalent to the provisions in the current test procedure subsection G.11.7 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

11.3 Charge-Depleting CO2 Produced.

Purpose: This subsection gives and explains the formula used to calculate Charge-Depleting CO_2 Produced.

Rationale: This subsection is equivalent to the current test procedure subsection G.11.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

11.4 Charge-Sustaining CO2 Produced.

11.4.1 Urban Charge-Sustaining CO2 Produced.

Purpose: This subsection gives and explains the formula used to calculate Urban Charge-Sustaining CO_2 Produced.

Rationale: This subsection is equivalent to the current test procedure subsection G.11.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

11.4.2 Highway Charge-Sustaining CO2 Produced.

Purpose: This subsection gives and explains the formula used to calculate Highway Charge-Sustaining CO_2 Produced.

Rationale: This subsection is equivalent to the current test procedure subsection G.11.3 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

11.5 Charge-Depleting Cycle Range.

11.5.1 Urban Charge-Depleting Cycle Range.

Purpose: This subsection explains how to calculate Urban Charge-Depleting Cycle Range.

Rationale: This subsection is equivalent to the current test procedure subsection G.11.8 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

11.5.2 Highway Charge-Depleting Cycle Range.

Purpose: This subsection explains how to calculate Highway Charge-Depleting Cycle Range.

Rationale: This subsection is equivalent to the current test procedure subsection G.11.11 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

11.6 Charge-Depleting Actual Range.

Purpose: This subsection is needed to define the Charge-Depleting Actual Range for the Urban Charge-Depleting Test.

Rationale: This subsection is equivalent to the current test procedure subsection G.11.9 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

11.7 Charge-Depleting Actual Range, Highway.

Purpose: The purpose of this section is to define the charge-depleting actual range for the Highway Charge-Depleting Range Test.

Rationale: The previous test procedure only defined the charge-depleting actual range for the urban range test so it is necessary to also define it for the highway range test since the term is used to calculate the highway electric range fraction in subsection E.11.9.2. The definition in this subsection is consistent with the definition used for the urban test in subsection E.11.6.

11.8 Charge-Depleting to Charge-Sustaining Range.

11.8.1 Urban Charge-Depleting to Charge-Sustaining Range.

Purpose: This subsection is needed to define the Urban Charge-Depleting to Charge-Sustaining Range for the Urban Charge-Depleting Test.

Rationale: This subsection is equivalent to the current test procedure subsection G.11.10 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

11.8.2 Highway Charge-Depleting to Charge-Sustaining Range.

Purpose: This subsection is needed to define the Highway Charge-Depleting to Charge-Sustaining Range for the Highway Charge-Depleting Range Test.

Rationale: This subsection is equivalent to the current test procedure subsection G.11.12 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

11.9 Electric Range Fraction (%).

Purpose: This subsection explains the meaning of Electric Range Fraction.

Rationale: The provision in this subsection is equivalent to provision given in the current test procedure in the first paragraph in subsection G.11.6 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

11.9.1 Urban Electric Range Fraction (%).

Purpose: This subsection explains how to calculate Urban Electric Range Fraction.

Rationale: The provision in this subsection is equivalent to provision given for the urban electric range fraction in subsection G.11.6 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles

and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

11.9.2 Highway Electric Range Fraction (%).

Purpose: This subsection explains how to calculate Highway Electric Range Fraction.

Rationale: The provision in this subsection is equivalent to provision given for the highway electric range fraction in subsection G.11.6 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

12. CALCULATIONS OF THE COMBINED GREENHOUSE GAS REGULATORY RATING.

12.1 Combined Greenhouse Gas Emissions.

Purpose: This subsection explains how to calculate the combined Greenhouse Gas (GHG) emissions value.

Rationale: This subsection is equivalent to the current test procedure subsection G.12.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

12.2 Urban Greenhouse Gas Emissions.

Purpose: This subsection explains how to calculate the urban GHG emissions value.

Rationale: This subsection is equivalent to the current test procedure subsection G.12.2.1 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

12.3 Highway Greenhouse Gas Emissions.

Purpose: This subsection explains how to calculate the highway GHG emissions value.

Rationale: This subsection is equivalent to the current test procedure subsection G.12.3 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

12.4 Charge-Depleting to Charge-Sustaining Range.

Purpose: This subsection is needed to define the Charge-Depleting to Charge-Sustaining Range.

Rationale: This subsection is equivalent to the current test procedure subsection G.12.2.2 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

12.5 Utility Factors for Urban and Highway Cycles.

Purpose: This subsection is necessary to provide the utility factors for urban and highway cycles that are used to calculate GHG emissions.

Rationale: This subsection is equivalent to the current test procedure subsection G.12.2.3 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

12.6 Charge-Depleting GHG Emissions from Electricity Use.

Purpose: This subsection explains how to calculate the charge-depleting GHG rate from AC electricity use.

Rationale: This subsection is equivalent to the current test procedure subsection G.12.2.4 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

12.7 Charge-Depleting Electricity Use.

Purpose: This subsection explains how to determine the AC electricity used during the urban and highway charge-depleting tests.

Rationale: This subsection is equivalent to the current test procedure subsection G.12.2.5 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

12.8 Charge-Sustaining Weighted CO2 Mass Emissions.

Purpose: This subsection explains how to calculate the weighted CO_2 mass emissions for a charge-sustaining test.

Rationale: This subsection is equivalent to the current test procedure subsection G.12.2.6 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

13. ADDITIONAL PROVISIONS.

13.1 Fuel Fired Heater Emission Testing

Purpose: This subsection specifies how to determine the emissions of a fuel fired heater.

Rationale: This subsection is identical to the current test procedure section G.4 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

13.2 Example Diagrams of Charge-Depleting Actual Range, Charge-Depleting Cycle Range, and Transitional Range.

Purpose: This subsection is needed to indicate the location of diagrams that illustrate examples of charge-depleting actual range, charge-depleting cycle range, and transitional range.

Rationale: This provisions in this subsection are identical to the provisions in the current test procedure in subsections G.9.2 and G.9.3 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

13.3 Insufficient Fuel.

Purpose: This subsection outlines the necessary procedure if there is insufficient fuel to run a subsequent test.

Rationale: This subsection is identical to the current test procedure subsection G.9.5 in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".

Section F. Plug-In Hybrid Electric Vehicle Exhaust Emission Test Sequence

Purpose: The figures in section F provide graphical illustrations of the PHEV tests described in section E.

Rationale: This section is equivalent to the current test procedure section I in "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck And Medium-Duty Vehicle Classes".