

Appendix F-B-2
Purpose and Rationale for
Proposed Amendments to the Otto-Cycle Test
Procedures

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

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List of Documents to be used in Conjunction With this Document

Purpose

“California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles” will be referred to as “evap. TPs”. The warranty requirements of section 2036, et seq., title 13, CCR and HD OBD certification requirements of section 1971, et seq., title 13, CCR are added and incorporated by reference. The proposed addition of the warranty and HD OBD sections has changed the numbering of the list.

Rationale

The abbreviation for “evap. TPs” is used in these test procedures and is therefore added here. It is also necessary to include the warranty requirements and HD OBD certification requirements to indicate these requirements are referred to and used in conjunction with these test procedures for the certification of heavy-duty vehicles.

2. Definitions. [86.xxx-2]**A. Federal Provisions****Paragraph 1****Purpose**

The purpose of this amendment is to enumerate the changes that must be made to this paragraph in order that the federal useful life provisions for Otto-Cycle engines in 40 CFR §86.004-2 can be meaningfully incorporated into the “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles” to support the proposed rulemaking. Subparagraphs 1.1 through 1.3 of this paragraph explain these changes in detail. The proposed useful life amendments to this paragraph are substantively identical to those proposed to title 13, CCR, 2112 (I)(22), as part of this rulemaking. However, these amendments to §86.004-2 will have all-inclusive applicability for all criteria-pollutant-based on-road heavy-duty vehicle regulations, whereas title 13, CCR, 2112, is limited to matters of recall and enforcement. All-inclusive applicability is necessary for defining the full useful life periods to be used in certifying engines families to the proposed standards. Useful life periods determine the duration over which an engine must maintain emissions at or below applicable emission standards. More representative useful life periods ensure that emissions are controlled in-use over an appropriate portion of an engine’s service life. The longer, more representative useful life periods proposed in this amendment will complement the proposed adoption of more stringent NOx and PM standards (see Chapters III Section A.1 and Section A.2 of the Staff Report), resulting in greater emissions reductions over time than just the adoption of lower exhaust standards alone. All-inclusive applicability is also necessary to ensure the applicability of warranty periods based on full useful life periods, such as for catalyst beds, are applied as intended by these amendments.

Rationale

The proposed amendments to §86.004-2 are specific to heavy-duty Otto-cycle engine useful life periods. Heavy-duty diesel engine useful life periods are specified in the “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles.”

The current useful life requirements are described in Chapter I, Section B.5 of this Staff Report; the need for amendments related to useful life is described in Chapter II, Section C.5; and the description of proposed useful life amendments and their feasibility is included in Chapter III, Section A.5.

The particular necessities of these amendments are described below:

Subparagraph 1.1 defines a range of alignment with the federal definitions in 40 CFR §86.004-2 from “*Ambulance*” through “*U.S.-directed production*” for which no change is required.

Subparagraph 1.2 announces the intent to amend the definition of “Useful Life” for heavy-duty Otto-cycle engines as it occurs in 40 CFR 86.004-2.

Subparagraph 1.2.1 identifies “Useful Life” subparagraphs (1) and (2) as inapplicable to these test procedures because they apply to categories other than heavy-duty Otto-cycle engines. 40 CFR 86.004-2 is inclusive of light-duty trucks and vehicles, but for the purposes of defining useful life periods within the “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles” only heavy-duty Otto-cycle engine useful life periods are applicable.

Subparagraph 1.2.2 deletes and replaces “Useful Life” subparagraph (3) in its entirety. Paragraph structure and numbering patterns are consistent with those in §86.004-2 “Useful Life” (4) of the “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles” to preserve alignment throughout the document to the extent feasible.

Subparagraph (3)(i) parallels the proposed useful life period definitions for heavy-duty Otto-cycle engines in 13 CCR 2112 subsection (l)(22)(A).

Purpose

The purpose of this amendment is to sunset the current useful life periods of 10 years and 110,000 miles for heavy-duty Otto-cycle engines through the 2026 model year. Additionally, this amendment exempts 2023 through 2026 model year Otto-cycle engines greater than 10,000 GVWR, but less than 14,000 GVWR, from these useful life periods.

Rationale

This amendment is necessary to provide manufacturers with sufficient lead time to transition to the longer, more representative useful life periods proposed in subparagraphs (3)(ii) and (3)(iii) beginning in 2027 and 2031, respectively, for heavy-duty Otto-cycle engines used in vehicles greater than 14,000 GVWR. Useful life periods determine the duration over which a heavy-duty engine must maintain emissions at or below applicable standards. Manufacturers will use the lead time to reengineer emissions-related parts, as necessary, to ensure that they are durable when the proposed useful life periods in subparagraphs (3)(ii) and (3)(iii) take effect. Current useful life periods apply only to the criteria emission standards carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons.

By definition, Otto-cycle engines used in medium-duty vehicles are a subset of heavy-duty Otto-cycle engines used in vehicles greater than 8,500 GVWR, but less than 14,000 GVWR (13 CCR 1900(b)(13)). Heavy-duty Otto-cycle engines are defined by use in vehicles greater than 8,500 GVWR (see 13 CCR 1900(b)(5)). This amendment clarifies that Otto-cycle engines used in vehicles greater than 10,000 GVWR, but less than 14,000 GVWR are exempt from the useful life periods in this subparagraph (3)(i).

Rather, these engines are subject to the useful life periods of 15 years and 150,000 miles for engines used in medium-duty vehicles as explained in subparagraph (3)(v). Although this amendment seemingly only exempts engines used in heavy-duty vehicles greater than 10,000 GVWR, but less than 14,000 GVWR until the 2026 model year, in fact all such engines within this GVWR range are exempt beginning with 2023 models and thereafter. The end date of 2026 is specified to maintain implementation sequence with this subparagraph; however, subparagraph (3)(v) makes it clear that there is no end date. Useful life periods for Otto-cycle engines used in heavy-duty vehicles less than or equal to 10,000 GVWR are regulated under separate regulations requiring chassis certification only (see 13 CCR 1961.2).

The current useful life requirements are described in Chapter I, Section B.5 of this Staff Report; the need for amendments related to useful life is described in Chapter II, Section C.5; and the description of proposed useful life amendments and their feasibility is included in Chapter III, Section A.5.

Subparagraph (3)(ii) parallels the proposed useful life period definitions for heavy-duty Otto-cycle engines in 13 CCR 2112 subsection (1)(22)(B).

Purpose

The purpose of this amendment is to adopt useful life periods of 12 years and 155,000 miles for 2027 through 2030 model year heavy-duty Otto-cycle engines used in heavy-duty vehicles with a GVWR greater than 14,000 pounds. This amendment establishes the first of two phases of more representative useful life periods for heavy-duty Otto-cycle engines.

Rationale

This amendment is necessary to ensure that useful life periods for heavy-duty Otto-cycle engines are representative of the actual service lives of modern heavy-duty vehicles greater than 14,000 GVWR (see Chapter I Section B.5.3 of the Staff Report). Useful life periods determine the duration over which an engine must maintain emissions at or below applicable standards. More representative useful life periods ensure that emissions are controlled in-use over an appropriate portion of an engine's service life. Accordingly, the longer, more representative useful life periods proposed in this amendment will complement the proposed adoption of more stringent NOx and PM standards (see Chapters III Section A.1 and Section A.2 of the Staff Report), resulting in greater emissions reductions over time than just the adoption of lower exhaust standards alone. These useful life periods apply only to the criteria emission standards carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons. The useful life periods in this subparagraph are the first of two phases of more representative useful life requirements. Implementing the proposed useful life periods in two phases provides manufacturers with an opportunity to evaluate new or reengineered product durability during the first phase, when periods are not as long, in order to improve the durability of emissions-related parts, as necessary, when the second phase is fully implemented.

The current useful life requirements are described in Chapter I, Section B.5 of this Staff Report; the need for amendments related to useful life is described in Chapter II, Section C.5; and the description of proposed useful life amendments and their feasibility is included in Chapter III, Section A.5.

Subparagraph (3)(iii) parallels the proposed useful life period definitions for heavy-duty Otto-cycle engines in 13 CCR 2112 subsection (1)(22)(C).

Purpose

The purpose of this amendment is to adopt useful life periods of 15 years and 200,000 miles for 2031 and subsequent model year heavy-duty Otto-cycle engines used in heavy-duty vehicles with a GVWR greater than 14,000 pounds. This amendment establishes the second (final) phase of more representative useful life periods for heavy-duty Otto-cycle engines.

Rationale

This amendment is necessary to ensure that useful life periods for heavy-duty Otto-cycle engines are representative of the actual service lives of modern heavy-duty vehicles greater than 14,000 GVWR (see Chapter I Section B.5.3 of the Staff Report). Useful life periods determine the duration over which an engine must maintain emissions at or below applicable standards. More representative useful life periods ensure that emissions are controlled in-use over an appropriate portion of an engine's service life. Accordingly, the longer, more representative useful life periods proposed in this amendment will complement the proposed adoption of more stringent NOx and PM standards (see Chapters III Section A.1 and Section A.2 of the Staff Report), resulting in greater emissions reductions over time than just the adoption of lower exhaust standards alone. These useful life periods apply only to the criteria emission standards carbon monoxide, particulate, oxides of nitrogen, and non-methane hydrocarbons. The useful life periods in this subparagraph are the second and final phase of more representative useful life requirements. Implementing the proposed useful life periods in two phases provides manufacturers with an opportunity to evaluate new or reengineered product durability during the first phase, when periods are not as long, in order to improve the durability of emissions-related parts, as necessary, when the second phase is fully implemented.

The current useful life requirements are described in Chapter I, Section B.5 of this Staff Report; the need for amendments related to useful life is described in Chapter II, Section C.5; and the description of proposed useful life amendments and their feasibility is included in Chapter III, Section A.5.

Subparagraph (3)(iv) parallels the proposed useful life period definitions for heavy-duty Otto-cycle engines in 13 CCR 2112 subsection (1)(22)(D).

Purpose

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The purpose of this amendment is to clarify that heavy-duty Otto-cycle engines used in vehicles greater than 10,000 GVWR, but less than 14,000 GVWR are subject to useful life periods of 15 years or 150,000 miles.

Rationale

This amendment is necessary to avoid confusion with respect to the correct useful life periods for heavy-duty Otto-cycle engines used in vehicles greater than 10,000 GVWR, but less than 14,000 GVWR (13 CCR 1900(b)(13)). As previously noted, Otto-cycle engines used in medium-duty vehicles are a subset of heavy-duty Otto-cycle engines. Heavy-duty Otto-cycle engines are defined by use in vehicles greater than 8,500 GVWR (13 CCR 1900(b)(5)) whereas medium-duty engines are defined by use in vehicles greater than 8,500 GVWR, but less than 14,000 GVWR. Accordingly, heavy-duty Otto-cycle engines used in vehicles greater than 10,000 GVWR, but less than or equal to 14,000 GVWR are not subject to the useful life periods in subparagraph (3)(i), but rather to the useful life periods for medium-duty vehicles, i.e., 15 years and 150,000 miles. Useful life periods for engines used in vehicles less than or equal to 10,000 GVWR are regulated under separate regulations requiring chassis certification only (see 13 CCR 1961.2).

The current requirements related to medium-duty vehicles are described in Chapter I, Section B.12 of this Staff Report; the need for medium-duty engine clarifications and amendments is described in Chapter II, Section C.12; and the description of proposed medium-duty engine clarifications and amendments is included in Chapter III, Section A.12.

Subparagraph 1.2.3 identifies “Useful Life” subparagraph (4) as inapplicable to these test procedures because it does not apply to Otto-cycle heavy-duty diesel engines, but rather to heavy-duty diesel engines. 40 CFR 86.004-2 is inclusive of light-duty trucks, vehicles, and diesel engines, but for the purposes of defining useful life periods within the “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Diesel Engines and Vehicles” only heavy-duty Otto-cycle engine useful life periods are applicable.

Subparagraph 1.2.4 maintains alignment with subparagraph (5) of the federal definition for “Useful Life” in 40 CFR §86.004-2 for which no change is required.

Subparagraph 1.2.5

Purpose

The purpose of this subsection is to define the useful life periods and model year implementation schedules for 2022 and subsequent model year Otto-cycle hybrid powertrains optionally certified pursuant to title 13, CCR §1956.8, used in heavy-duty vehicles with a GVWR greater than 14,000 pounds.

Rationale

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This amendment is necessary to set the applicable useful life periods and model year implementation schedules for 2022 and subsequent model year Otto-cycle hybrid powertrains optionally certified pursuant to title 13, CCR §1956.8. Due to differences in the useful life periods and model year implementation schedules for heavy-duty Otto-cycle engines used in vehicles with a GVWR greater than 14,000 pounds, depending on the vehicle's GVWR, the proposed amendment specifically identifies the applicable heavy-duty engine useful life periods that manufacturers of Otto-cycle hybrid powertrains would use for their hybrid powertrain systems. These proposed requirements align with those for heavy-duty Otto-cycle engines. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Subparagraph 1.3 deletes the existing definition of a "Warranty period" and replaces it with a reference to 13 CCR 2036, where the California-specific warranty requirements are codified.

B. California Provisions

Purpose

The purpose of this section is to set forth definitions for various terms used throughout this document, including proposed amendments of the heavy-duty Otto-cycle engine and vehicle regulations and associated amendments and to identify the sections for which the definitions apply.

Rationale

The new definitions are necessary to set forth descriptions for various terms used in the proposed amendments to the heavy-duty engine and vehicle regulation and associated amendments. These new definitions would be used to further explain what is required and how the regulation's requirement must be met.

"50-state-directed engines"

Purpose

The proposed amendment provides a definition of "50-state-directed engines" where a manufacturer's entire volume of diesel and Otto-cycle engines is produced and intended for sale nationwide using the proposed optional 50-state-directed engine emission standards. Manufacturers would certify these engine families as 50-state families.

Rationale

The addition of this definition is needed to establish a specific description and to maintain consistency in how this new terminology is used among manufacturers for compliance with the regulation. This term is necessary to define the total number of a manufacturer's engines produced and intended for sale in California and the other 49 states, including both diesel and Otto-cycle engines, in a given model year, that will be

used in medium-duty vehicles, heavy-duty vehicles, and hybrid powertrains. The proposed amendments provide an optional 50-state-directed engine emission standards certification pathway to manufacturers as described in Chapter III, Section A.1.1.1.2 of this Staff Report.

“California sales volume”

Purpose

This proposed amendment provides a definition of “California sales volume” as the number of new California certified engines or new vehicles sold in a given model year within the State of California when used in this regulation.

Rationale

As discussed further in Chapter III, Section A.7.2 of this Staff Report, the addition of this definition is needed to specify the meaning of California sales volume. This term is used when calculating averaging, banking, and trading (ABT) credits for California when reporting the volume of certified engines produced and delivered for sale in California and for sales volume of the zero-emission vehicle models sold within the given vehicle family during the model year.

“Class 4,” “Class 5,” “Class 6,” “Class 7,” and “Class 8”

Purpose

Under California regulations, heavy-duty vehicles are grouped by weight class. Hence, new vehicle weight class definitions are added to provide terminologies of “Class 4,” “Class 5,” “Class 6,” “Class 7,” and “Class 8.”

Rationale

The addition of these definitions is needed to establish boundaries and to define each vehicle weight class category by gross vehicle weight rating. These definitions are needed for the calculation of NO_x credits under the California-only averaging, banking, and trading (CA-ABT) program for heavy-duty zero-emission vehicles (HD-ZEVs) as described in Chapter III, Section A.7.5 of this Staff Report.

“Conformity factor”

Purpose

The purpose of this amendment is to create a new definition for the term “Conformity factor.”

Rationale

This amendment is necessary because only the multiplier used in calculating NTE compliance thresholds is currently described in the test procedures. The conformity factor is a multiplier used in calculating the emissions in-use thresholds for heavy-duty in-use testing under the MAW test procedures described in section 86.1370.B of these

test procedures. The multiplication of the conformity factor and the applicable emission standard equals the emissions in-use threshold.

The current in-use test procedures are described in Chapter I, Section B.3 of this Staff Report; the need for amendments related to the procedures is described in Chapter II, Section C.3; and the description of proposed amendments is included in Chapter III, Section A.3.

“Family certification level or FCL”

Purpose

The purpose of this amendment is to create a definition for the term “Family certification level or FCL” That is identical to the definition in section 1036.801 of these test procedures.

Rationale

This amendment is necessary because the FCL is a necessary component in calculating Sum-Over-Sum (SOS) emissions per the equation in §86.1370.B.1.5 of these test procedures. The SOS calculation is the basis for determining a heavy-duty engine’s compliance with in-use standards.

The current in-use test procedures are described in Chapter I, Section B.3 of this Staff Report; the need for amendments related to the HDIUT procedures is described in Chapter II, Section C.3; and the description of proposed amendments is included in Chapter III, Section A.3.

“Field fix”

Purpose

A new definition is added to provide descriptions of “Field Fix” when used in certification. This definition refers to the standard practices that are used by the manufacturers after the production engines leave the assembly line.

Rationale

The addition of this definition is needed to establish specific descriptions and to maintain consistency in how this terminology is used by the manufacturers in the certification process. A field fix means making changes to the engine/vehicles after the products have left the assembly line. Certification test cycles are described in Chapter I, Section B.2 of this Staff Report.

“Heavy-Duty Transient Federal Test Procedure or FTP cycle”

Purpose

This definition is added to provide a consistent terminology of “FTP cycle” with the existing federal definition specified in 40 CFR section §86.008-10(a)(2), as last amended on October 25, 2016, which is already incorporated by reference in these test

procedures. The FTP has been the primary transient cycle used for the emissions certification of all heavy-duty on-road engines with GVWR greater than 10,000 pounds in California for many years. This FTP test cycle is run with both a cold- and a hot-start transient duty cycle designed to represent urban driving.

Rationale

As discussed further in Chapter III, Section A.1.1.1 of this Staff Report, this definition is needed to establish a specific description of this terminology, because this test cycle is used in the proposed certification emission standards tables.

“In-use threshold”

Purpose

The purpose of this amendment is to create a new definition for the term “In-use Threshold.”

Rationale

This amendment is necessary to establish the applicable pass or fail emission levels for determining an engine’s compliance under the MAW heavy-duty in-use test program described in section 86.1370.B of these test procedures. An “In-use Threshold” is the value of the applicable emission standard (NMHC, NOx, CO, or PM) multiplied by the appropriate conformity factor.

The current in-use test procedures are described in Chapter I, Section B.3 of this Staff Report; the need for amendments related to the procedures is described in Chapter II, Section C.3; and the description of proposed amendments is included in Chapter III, Section A.3.

“Optional low NOx engine”

Purpose

The definition is modified to reference the existing optional low NOx engine standards as well as the proposed 2024 and subsequent model optional low NOx engine standards.

Rationale

The proposed amendment is necessary to include the proposed optional Low NOx engine standards for 2024 and subsequent model years. Previously, the optional low NOx engine standards were defined for 2015 and subsequent model years. Since these proposed amendments contain new lower emission standards starting with the 2024 model year and since the proposed standards are as low or lower than the current optional low NOx engine standards, a new set of optional low NOx standards are defined for 2024 and subsequent model years. Therefore, all optional low NOx emission standards are now described in subparagraphs I.10.B.1 and I.10.B.3.2 of these test procedures. Optional low NOx standards are further described in Chapter I, Section B.1.3 of this Staff Report.

“Optionally Certified Hybrid powertrain or hybrid powertrain or heavy-duty hybrid powertrain” and “Optionally certified Otto-cycle hybrid powertrain or Otto-cycle hybrid powertrain or heavy-duty Otto-cycle hybrid powertrain”

Purpose

The purpose of this subsection is to define “optionally certified hybrid powertrain or hybrid powertrain or optionally certified Otto-cycle hybrid powertrain or Otto-cycle hybrid powertrain”.

Rationale

This amendment is necessary to describe what is meant by “optionally certified hybrid powertrain or hybrid powertrain or optionally certified Otto-cycle hybrid powertrain or Otto-cycle hybrid powertrain” as used in these test procedures to establish a common understanding of the components that are considered to be comprised of an Otto-cycle hybrid powertrain system that is optionally certified to criteria pollutants emissions and greenhouse gas emissions pursuant to title 13, CCR §1956.8. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

“Portable emission measurement system (PEMS)”

Purpose

The purpose of this amendment is to create a new definition for the term “Portable emission measurement system (PEMS).”

Rationale

This amendment is necessary because CARB’s heavy-duty in-use programs utilize PEMS for measuring and recording the emissions data used for determining an engine’s compliance with applicable in-use standards. A PEMS unit is a measurement system consisting of portable equipment that can be used to generate brake-specific emission measurements during on-road in-use testing or laboratory in-use testing.

The current in-use test procedures are described in Chapter I, Section B.3 of this Staff Report; the need for amendments related to the procedures is described in Chapter II, Section C.3; and the description of proposed amendments is included in Chapter III, Section A.3.

“Running Change”

Purpose

A new definition is added to provide a description of “Running Change” when used in certification. This definition refers to standard practices that are used by the manufacturers during the production period of engine families.

Rationale

The addition of this definition is needed to establish a specific description and to maintain consistency in how this terminology is used by the manufacturers in the certification process, during the production period of the engine. A running change applies to engine/vehicles that have not left the assembly line yet. Certification test cycles are described in Chapter I, Section B.2 of this Staff Report.

“Vehicle family”

Purpose

The proposed amendment defines “Vehicle family” for this regulation to align with the California Phase 2 GHG regulation’s vehicle family definition.

Rationale

As discussed further in Chapter III, Section A.7.5 of this Staff Report, the addition of this definition is needed to inform regulated entities on how to group their zero-emission vehicles in one family for NOx credits calculation. Zero-emission NOx credits are calculated for each certified zero-emission vehicle model within the vehicle family. This definition aligns with CARB’s existing Phase 2 GHG regulation.

Additionally, this definition is necessary because the vehicle family name is one of the required information inputs for the proposed in-use NOx emission reports.

“Vehicle-FTP”

Purpose

The proposed amendment provides the definition of “Vehicle-FTP” cycle.

Rationale

The Vehicle-FTP cycle is used when calculating the NOx credits for zero-emission vehicle families as described in Chapter III, Section A.7.5 of this Staff Report.

“Zero-emission vehicle”

Purpose

The proposed amendment provides a definition of “Zero-emission vehicle” as having a drivetrain that produces zero exhaust emissions of any criteria pollutant, precursor pollutants, or greenhouse gases under any possible operational modes or conditions.

Rationale

As discussed further in Chapter III, Section A.7.5 of this Staff Report, the addition of this definition is needed to set forth the meaning of this term so that these vehicles would not produce any criteria, precursor, or greenhouse gas pollutants. The term is used in the proposed amendments to determine how HD-ZEV manufacturers would calculate

and accrue NOx credits from this regulation as early as model year 2022 under the California-only averaging, banking and trading program.

3. Abbreviations. [§86.xxx-3]

A. Federal Provisions.

B. California Provisions.

Purpose

The purpose of this section is to set forth abbreviations for various terms used throughout these test procedures and to identify the sections in which these abbreviations are described.

Rationale

The new abbreviations are necessary to set forth descriptions for various terms used in the proposed amendments. These new abbreviations would be used throughout the various sections of the regulations.

“CA-ABT”

Purpose

The benefit of the ABT program is to provide flexibility to manufacturers in meeting the emissions standards. Currently, engine manufacturers participate in a single federal-ABT program on the national (50-state) level. The introduction of the new proposed heavy-duty zero-emission averaging set in the 2022 model year would require a new CA-ABT. Furthermore, the proposed NOx emissions standard would change in California, effective in the 2024 model year. These changes would require the establishment of the CA-ABT program.

Rationale

As discussed further in Chapter I, Section B.7.1 and Chapter III, Section A.7 of this Staff Report, the introduction of the CA-ABT is needed to provide an ABT mechanism to HD-ZEV manufacturers starting with the 2022 model year. Additionally, California would adopt more stringent emission standards for NOx in the 2024 model year; thus, the current federal ABT accounting mechanism would no longer be sufficient. Therefore, this abbreviation is necessary to track CA-ABT credits separately from the 49-state-ABT. Furthermore, this definition would provide a credit transfer mechanism to resolve ABT accounting discrepancies between CARB and U.S. EPA for 2022 and subsequent model year engine families.

“MAW”

Purpose

The purpose of this amendment is to add the acronym “MAW” to the test procedures, which stands for “Moving Average Window.”

Rationale

This amendment is necessary because the acronym “MAW” is used repeatedly in the test procedures with respect to the proposed method for performing in-use testing of heavy-duty engines described in section 86.1370.B of these test procedures. The MAW method establishes compliance with applicable emissions in-use thresholds by continuously averaging emissions data collected during an in-use evaluation at 300 second intervals.

The current in-use test procedures are described in Chapter I, Section B.3 of this Staff Report; the need for amendments related to the procedures is described in Chapter II, Section C.3; and the description of proposed amendments is included in Chapter III, Section A.3.

10. Emission standards for Otto-Cycle heavy-duty engines and vehicles.

[\$86.xxx-10]

A. Federal Provisions

Paragraph 4 - §86.008-10.

Subparagraph 4.1.1

Purpose

Section 86.008-10 contains the applicable emission standards and requirements for 2008 and subsequent model year Otto-cycle heavy-duty engines and vehicles. Subparagraph (a)(2) is modified to establish existing exhaust emission standards for only new 2008 through 2023 model year Otto-cycle heavy-duty engine and to direct the new 2024 and later model year Otto-cycle heavy-duty engines to proposed emissions standards in subparagraph I.10.B. The proposed modification also includes amending the section numbering because of the proposed added new subparagraph.

Rationale

As discussed further in Chapter III, section A.1 of the Staff Report, CARB staff is proposing new tailpipe NOx and PM exhaust emission standards applicable to 2024 and subsequent model year Otto-cycle engines. These new standards apply only to California certified engines and therefore are specified under the California Provisions in subparagraph I.10.B of the Test Procedures. These modifications are necessary in order to continue to certify new 2008 through 2023 model year Otto-cycle heavy-duty engines to the current standards and to direct 2024 and later model year Otto-cycle heavy-duty engines to proposed California exhaust emission standards as specified under California Provisions in subparagraph I.10.B. These standards, in combination with the certification procedures, are necessary to establish a process to certify these engines.

B. California Provisions

Paragraph 1, Table and Footnote F

Purpose

The purpose of this paragraph is to sunset the current provisions for 2004 through 2023 model Otto-cycle heavy-duty engines. The words “and Subsequent” or “and later” are deleted, and the words “through 2023” are added from the introductory paragraph and in the table since these standards would apply only up to 2023 model year Otto-cycle heavy-duty engines.

Rationale

As discussed further in Chapter III, section A.1 of the Staff Report, CARB staff is proposing new NO_x and PM exhaust standards applicable to 2024 and subsequent model Otto-cycle engines used in heavy-duty vehicles over 14,000 pounds and incomplete medium-duty vehicles from 10,001 to 14,000 pounds GVWR. Thus, the proposed modification is necessary to inform manufacturers that these exhaust emission standards apply only to 2004 through 2023 model year Otto-cycle engines.

Paragraph 2.

Purpose

The phrase “2023 and earlier model year” is added since these standards would apply only up to the 2023 model year Otto-cycle heavy-duty engines.

Rationale

Since CARB staff is proposing new NO_x standards for 2024 and subsequent model year Otto-cycle engines, the proposed modification is necessary to inform manufacturers of the applicable model year for the existing optional standards for complete and incomplete heavy-duty vehicles.

Paragraph 3 and subparagraph 3.1

Purpose

The purpose of new paragraph 3 and subparagraph 3.1 is to specify the proposed exhaust emission standards for 2024 and subsequent model Otto-cycle heavy-duty engines used in vehicles over 14,000 pounds GVWR and Otto-cycle engines used in incomplete medium-duty vehicles from 10,001 to 14,000 pounds GVWR. Furthermore, the footnotes to the table specify (1) the option for a manufacturer to certify engines used in incomplete medium-duty vehicles to the proposed medium-duty engine standards in lieu of the primary standards for complete vehicles specified in 13 CCR 1961.2 and (2) that engines certified for use in medium-duty vehicles could not be used in a heavy-duty vehicle over 14,000 pounds GVWR.

Rationale

As discussed further in Chapter III, section A.1 of the Staff Report, these modifications are necessary in order to establish proposed California exhaust emission standards for

new 2024 and subsequent model Otto-cycle heavy-duty engines used in vehicles over 14,000 pounds GVWR and Otto-cycle engines used in incomplete medium-duty vehicles from 10,001 to 14,000 pounds GVWR.

The proposed table is necessary to establish the proposed, lower NOx and PM emission standards for the FTP cycle for 2024 through 2026 model year heavy-duty engines and 2027 and subsequent model year heavy-duty engines. Furthermore, the proposed footnote A to the table would continue to provide manufacturers the existing flexibility to certify engines used in incomplete medium-duty vehicles to the proposed engine standards as an alternative to the medium-duty vehicle standards specified in 13 CCR 1961.2. In addition, the proposed amendment to clarify that a medium-duty vehicle cannot be used in a heavy-duty vehicle over 14,000 pounds GVWR is necessary because heavy-duty engines used in vehicles greater than 14,000 pounds GVWR would be certified to the proposed useful life requirements that are significantly longer than the useful life for medium-duty engines. This statement does not change the current certification practice; however, it would provide clarification and inform manufacturers that it is a violation of California regulations to do otherwise. The proposed standards, in combination with the proposed certification procedures, are necessary to establish a process to certify these engines.

Subparagraph 3.2

Purpose

The purpose of new subparagraph 3.2 is to specify the optional low NOx emission standards that manufacturers may elect to certify Otto-cycle heavy-duty engines used in vehicles over 14,000 pounds GVWR in lieu of the primary NOx emissions standards applicable for that model year. Footnote A to the table prohibits an engine family certified to the optional low NOx standards to participate in the NOx ABT program but allows the engine family to participate in the PM ABT program.

Rationale

As discussed further in Chapter III, section A.1 of the Staff Report, these modifications are necessary to provide manufacturer the option to certify to the proposed optional low NOx emission standards that are much lower than the mandatory primary standards. Similar to the existing optional low NOx standards for 2023 and older model year engines in subparagraph I.10.B.1, the proposed optional low-NOx standards are developed to pave the way for future standards by providing manufacturers a mechanism to certify engines to significantly lower emission standards earlier than is required. In addition, there may be incentive programs that would further encourage the purchase of certified optional low NOx engines. Since 2016, manufacturers have been certifying natural gas and propane-fueled low NOx engines to the optional low NOx emission standards that are 50-90 percent lower than the current primary standards. For the same reasons, CARB staff is now proposing optional low NOx standards that are 60 percent and 50 percent lower than the proposed 2024 and 2027 model year NOx standards, respectively. These modifications are necessary in order to establish optional low NOx emission standards for new 2024 and later model year heavy-duty

Otto-cycle engines. Furthermore, the proposed amendment in footnote A regarding ABT participation is necessary to avoid double counting NOx emission reductions both by certifying to an optional low NOx standard thereby qualifying for an incentive funding, and by taking NOx credits in the ABT. These standards, in combination with the certification procedures, are necessary to establish a process to certify these engines.

Subparagraphs 3.3 and 3.3.1

Purpose

The purpose of subparagraphs 3.3 and 3.3.1 is to specify the optional 50-state-directed engine emission standards to which a manufacturer may optionally certify all its 2024 through 2026 model year Otto-cycle heavy-duty engines used in vehicles over 14,000 pounds GVWR, and engines used in incomplete medium-duty vehicles from 10,001 to 14,000 pounds GVWR. Furthermore, the footnotes to the table specify (1) the option for a manufacturer to certify engines used in incomplete medium-duty vehicles to the proposed medium-duty engine standards in lieu of the primary standards for complete vehicles specified in 13 CCR 1961.2, and (2) that an engine certified for use in medium-duty vehicles could not be used in a heavy-duty vehicle over 14,000 pounds GVWR.

Rationale

As discussed further in Chapter III, Section A.1 of the Staff Report, the proposed amendments include a provision that allows a manufacturer to certify its 2024 through 2026 model year engines to the proposed optional 50-state-directed engine emission standards, which are less stringent than the proposed primary California standards. To participate in the proposed optional 50-state-directed engine emission standards, a manufacturer must commit to (1) certifying all the engines in a given model year, both diesel and Otto-cycle, and optionally certified hybrid powertrains, that the manufacturer produces, that are intended for sale in the United States and not just California, to the optional 50-state-directed engine emission standards or to emission standards that are lower than the optional 50-state-directed engine emission standards, (2) forgoing any emissions credits generated in the federal ABT program for engines certified to the optional 50-state-directed engine emission standards, and (3) complying with all applicable California engine requirements for certification, labeling, on-board diagnostic, warranty, and in-use compliance. These provisions are necessary to ensure California emission benefits achieved with the optional 50-state-directed engine emission standards are equivalent or greater than that which would have been achieved with the proposed primary emission standards for 2024 through 2026 model years.

Furthermore, the proposed footnote A to the table would continue to provide manufacturers the existing flexibility to certify engines used in incomplete medium-duty vehicles to the proposed engine standards as an alternative to the medium-duty vehicle standards specified in 13 CCR 1961.2. In addition, the proposed amendment to clarify that a medium-duty vehicle cannot be used in a heavy-duty vehicle over 14,000 pounds GVWR is necessary because heavy-duty engines used in vehicles greater than 14,000 pounds GVWR would be certified to the proposed useful life requirements that are significantly longer than the useful life for medium-duty engines. This statement does

not change the current certification practice; however, it would provide clarification and inform manufacturers that it is a violation of California regulations to do otherwise. The proposed standards, in combination with the proposed certification procedures, are necessary to establish a process to certify these engines.

This optional program would provide greater air quality benefits to California as compared to that achieved through the more stringent, proposed California-only mandatory emission standards since federally-certified trucks that travel in California contribute to a significant portion of truck emission inventory. With the optional program, federally-certified trucks with engines certified to optional 50-state-directed engine emission standards that travel in California would be lower-emitting than existing trucks certified to the current higher federal emission standards. In addition, this option would allow engine manufacturers to meet California's requirements at a lower per engine cost since the standards are less stringent and the technologies and strategies needed to meet those standards are less complex. Furthermore, this option would allow manufacturers to make one set of national 50-state certified engines, thereby reducing overall cost of compliance because of scales of economy, by spreading the overall cost to a larger number of engines sold nationwide.

Subparagraphs 3.3.2, 3.3.3, and 3.3.4

Purpose

Subparagraph 3.3.2 specifies that the manufacturer must certify all its new 50-state-directed diesel engines at or below the optional 50-state-directed engine emission standards for new 2024 through 2026 model year Otto-cycle heavy-duty engines. Additionally, under subparagraph 3.3.3, a manufacturer certifying to the optional 50-state-directed engine emission standards for all model year engines are not obligated to but could certify any engine family to the standards specified in subparagraph 3.1 for that model year. Finally, per subparagraph 3.3.4, a manufacturer that chooses to participate in the optional 50-state-directed engine emission standards must forfeit any credits generated from U.S. production sales in the federal ABT.

Rationale

As discussed further in Chapter III, Section A.1 of the Staff Report and in the rationale discussion for Subparagraphs 3.3 and 3.3.1 of this section, these modifications would establish the conditions that a manufacturer would have to meet in order to participate in the optional 50-state-directed engine emission standards. Compliance with the proposed conditions are necessary in order for California to achieve net emission benefit gains by providing manufacturers the flexibility to certify to less stringent 50-state-directed engine emission standards. Emission benefits are gained by having all heavy-duty vehicles, which are sold out-of-state, that travel in California to be certified to a lower NOx standard than they would be required under the existing federal program. Furthermore, manufacturers would not be able to claim emission credits in the federal ABT and thus eliminating double counting of the emission benefits. This is necessary to prevent federal emission credits that would have been claimed through compliance with the optional 50-state-directed engine emission standards to be used by a manufacturer

who now can certify engines to higher family emission limits. These standards, in combination with the certification procedures, are necessary to establish an optional process to certify these engines.

Subparagraphs 3.3.5 and 3.3.6

Subparagraph 3.3.5 specifies the consequence for violation of the requirement to certify all diesel and Otto-cycle engines produced by the manufacturer to the optional 50-state-directed engine emission standards in a given model year, and Subparagraph 3.3.6 specifies additional conditions that the manufacturer would need to meet in order to participate in this optional program.

Rationale

As discussed further in Chapter III, Section A.1 of the Staff Report and in the rationale discussion for Subparagraphs 3.3, 3.3.1, 3.3.2, 3.3.3, and 3.3.4 of this section, subparagraph 3.3.5 is necessary to establish the consequences for failing to certify all its new 50-state-directed diesel engines at or below the optional 50-state-directed engine emission standards for any model year. According to this subparagraph, a manufacturer that is found in violation of the provisions of the 50-state-directed engine emission standards would be prohibited from participation in the program in any model year following the following the model year for which the violation occurred.

The addition of Subparagraph 3.3.6 is necessary to establish additional requirements that the manufacturer must meet in order to participate in this optional program. That is, in addition to certifying to the 50-state-directed engine emission Standards, the manufacturer must also have to comply with all applicable model year requirements including warranty, OBD, in-use testing, and other requirements.

Paragraph 4

Purpose

The purpose of this paragraph is to define the exhaust emission standards and model year implementation schedules for 2022 and subsequent model year Otto-cycle hybrid powertrains optionally certified pursuant to title 13, CCR §1956.8, used in heavy-duty vehicles with a GVWR greater than 14,000 pounds.

Rationale

This amendment is necessary to set the applicable exhaust emission standards and model year implementation schedules for 2022 and subsequent model year Otto-cycle hybrid powertrains optionally certified pursuant to title 13, CCR §1956.8. Due to differences in the exhaust emission standards and model year implementation schedules for heavy-duty Otto-cycle engines installed in vehicles, depending on the vehicle's GVWR, the proposed amendment specifically identifies the applicable heavy-duty Otto-cycle engine exhaust emission standards used in vehicles over 14,000 pounds GVWR that manufacturers of Otto-cycle hybrid powertrains would use for their hybrid powertrain systems. These proposed requirements align with those for heavy-

duty Otto-cycle engines. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Paragraph 5

Purpose

The purpose of this paragraph is to add the newly proposed MAW requirements to the applicable emission standards and certification requirements for 2024 and subsequent model year Otto-cycle heavy-duty engines.

Rationale

This amendment is necessary to require manufacturers to design 2024 and subsequent model year Otto-cycle engines to comply with the proposed MAW requirements as part of the certification requirements. The proposed MAW method provides a representative and reliable in-use compliance procedure, allowing the ability to confirm that the engine's in-use emissions are not exceeding the certification levels.

The MAW test procedures are described in Chapter I, Section B.3 of this Staff Report; the need for amendments related to the procedures is described in Chapter II, Section C.3; and the description of proposed amendments is included in Chapter III, Section A.3.

12. Alternative certification procedures. [§86.080-12]

A. Federal Provisions. [No change]

B. California Provisions.

Subparagraph 1.1 maintains alignment with subparagraphs (a)(1) through (a)(4) of the federal provisions.

Subparagraph 1.2

Purpose

The purpose of this subparagraph is to allow the Executive Officer to accept compliance with emission standards through alternative certification procedures. The proposed amendment adds an optional powertrain certification test procedure for 2022 and subsequent model year Otto-cycle hybrid powertrains optionally certified to criteria pollutants emission standards pursuant to title 13 CCR section 1956.8 and to specify that such Otto-cycle hybrid powertrains would need to comply with all applicable emission standards for on-road heavy-duty Otto-cycle engines for any given model year.

Rationale

This amendment is necessary to allow 2022 and subsequent model year Otto-cycle hybrid powertrains to use powertrain testing to optionally certified to criteria pollutants emission standards pursuant to title 13, CCR §1956.8. The existing language in this subsection does not allow for this optional certification procedure for Otto-cycle hybrid powertrains. Without this amendment, Otto-cycle hybrid powertrains would not be able to be optionally certified to criteria pollutants emissions standards. The amendment's language requiring optionally certified Otto-cycle hybrid powertrains to comply with all applicable emission standards for heavy-duty on-road engines is necessary to align certification requirements across different technologies so as to provide a consistent level of useful life, emissions warranty, on-board diagnostics and durability demonstration for engines and powertrains installed in similar vehicle classes and/or employed in similar vocations. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

15. NOx and particulate averaging, trading, and banking for heavy-duty engines. [§86.xxx-15].

B. California Provisions.

Paragraph 2.

Purpose

Paragraph 2 introduces the provisions for the new proposed CA-ABT program starting with the 2022 model year. There are some key differences between the proposed CA-ABT and the federal-ABT program, including a new heavy-duty zero-emission averaging set and reinstitution of shelf life requirements for credits.

Rationale

In order to incentivize the introduction of HD-ZEVs into the California market, these proposed amendments are necessary to provide a new pathway for HD-ZEV manufacturers to generate NOx credits in the CA-ABT program. In Chapter I, Section B.7.2 of this Staff Report, the interactions between this incentive mechanism and the Advanced Clean Truck regulations are discussed. Additionally, since California proposes to introduce more stringent NOx emissions standards in 2024 model year, a separate CA-ABT program is needed. Starting with 2022 model years, the proposed amendments would require manufacturers to track federal-ABT and CA-ABT programs separately.

The current ABT program is described in Chapter I, Section B.7 of this Staff Report; the need for amendments related to the ABT program is described in Chapter II, Section C.7; and the description of proposed ABT program amendments is included in Chapter III, Section A.7.

Subparagraph (a)

Purpose

The purpose of subparagraphs (a)(1) to (a)(2) is to define the different averaging sets within the proposed CA-ABT program. There would be a total of two averaging sets in the proposed CA-ABT program. These include the heavy-duty Otto-cycle and the heavy-duty zero-emissions averaging sets. The heavy-duty zero-emissions averaging set is a new averaging set for NOx ABT only.

Rationale

The proposed amendments are needed because averaging sets are an important component of the CA-ABT program. While the ABT program provides flexibility to manufacturers to attain emissions compliance on a corporate-wide basis, the intent of the averaging sets is to assure that compliance is reached for each primary intended service class. In other words, each manufacturer must assure corporate-wide compliance with the applicable standards within each averaging set.

Historically, the federal-ABT program for heavy-duty Otto-cycle engines was comprised of one averaging set. This is further described in Chapter I, Section B.7.1 of this Staff Report. The proposed CA-ABT program introduces the new heavy-duty zero-emission averaging set for NOx ABT only as described in Chapter III, Section A.7.5 of this Staff Report. Credits are only granted for NOx in this averaging set because achieving lower NOx emissions requires the introduction of new, advanced technologies. The technology for reduced NMHC emissions is currently available commercially with a three-way catalytic converter, and staff does not believe further incentives in that area are needed.

Another feature of the new CA-ABT is the inclusion of hybrid powertrains that are certified under the proposed optional hybrid powertrain certification process. This feature would incentivize the introduction of hybrid powertrains that are compliant with the proposed, more stringent emissions standards for 2024 and subsequent model years. The methodology is further described in Chapter III, Section A.7.3 of this Staff Report.

Subparagraph (b)

Purpose

The purpose of subparagraph (b) is to establish the rules regarding the transfer of credits between the different averaging sets. The existing rules from the federal-ABT program would continue to be applicable in the proposed CA-ABT program with the exception of transferring NOx credits generated in the proposed heavy-duty zero-emission averaging set. Therefore, NOx credits from the heavy-duty zero-emission averaging set could be transferred into any other averaging set such as the light heavy-duty diesel, medium heavy-duty diesel, heavy heavy-duty diesel or the heavy-duty Otto-cycle averaging set.

Rationale

This subparagraph is necessary to establish the boundaries in terms of transferring emission credits between different averaging sets in the proposed CA-ABT program. Historically, transfer of credits between different averaging sets has been prohibited in the federal-ABT program to assure that manufacturers attain compliance with the applicable standards for each individual service class. The same practice would continue in the CA-ABT program with the exception of the NO_x credits in the proposed heavy-duty zero-emission averaging set. This is further described in Chapter I, Section B.7.1 of this Staff Report.

In order to incentivize the introduction of HD-ZEVs into the California market, manufacturers would be allowed to transfer the NO_x credits from the heavy-duty zero-emission averaging set into any other diesel or Otto-cycle (combustion engine) ABT averaging set. This incentive would further assist the HD-ZEV manufacturers to introduce new zero-emissions technologies into the California market thereby leading to lower criteria and greenhouse gas emissions. The only applicable restriction is that credits from the heavy-duty zero-emission averaging set can only be transferred if the corresponding combustion engine averaging set has a deficit that needs to be remedied. If the combustion engine averaging set does not have any deficits, then no transferring of heavy-duty zero-emission credits will be allowed. Since all of the credits in the heavy-duty zero-emission averaging set expire at the end of 2030 model year, this mechanism is needed to prevent the manufacturers from circumventing the intent of the regulations by moving all of their heavy-duty zero-emission NO_x credits into the combustion engine averaging sets before 2031 model year. Additional information is provided in Chapter III, Section A.7.5 of this Staff Report.

Subparagraph (c)

Purpose

The purpose of subparagraph (c) is to provide guidance on existing federal-ABT program credits generated during 2009 and previous model years. The proposed amendment prevents manufacturers from transferring or using these credits in the CA-ABT program.

Rationale

The proposed subparagraph is necessary to restrict the transfer of 2009 and previous model year credits into the proposed CA-ABT program. The history of credit life requirements under the federal-ABT program is described in Chapter III, Section A.7.4 of this Staff Report. The credits in the federal-ABT program were subject to a 3-year credit life requirement before the 2004 model year. However, U.S. EPA removed this requirement in 2004 due to a request by the engine manufacturers. The rationale used by U.S. EPA was that their analysis showed that all federal-ABT credits will be used by the 2010 model year. Using the conclusions from that analysis, any banked, pre-2010 generated credits in the federal-ABT program would not be eligible for transferring into the proposed CA-ABT program.

Subparagraph (d)

Purpose

The purpose of subparagraph (d) is to set the parameters for the credit transfer mechanism between the federal-ABT and the proposed CA-ABT programs. Since heavy-duty truck sales in California only represent a percentage of the total 50-state heavy-duty truck sales, a portion of federal-ABT credits generated in 2010 through 2021 model years would be allowed to be transferred into the CA-ABT program in the 2022 model year for each applicable averaging set.

Rationale

This new subparagraph is necessary to ensure that the amount of federal-ABT credits that can be transferred into the proposed CA-ABT account are reasonable and proportional to the California sales volume for each primary intended service class. Thus, a manufacturer could not fill its CA-ABT account with credits unrelated to California sales volume. This is further described in Chapter III, Section A.7.1 of this Staff Report.

Subparagraph (e)

Purpose

The purpose of subparagraph (e) is to provide the mathematical equation to calculate the maximum allowance for the transfer of federal-ABT credits into the proposed CA-ABT program.

Rationale

This new subparagraph is necessary to ensure that the amount of credit a manufacturer transfers from its existing federal-ABT account into its new proposed CA-ABT account is reasonable and proportional to the volume of sales a manufacturer has in California. The equation requires each manufacturer to calculate the ratio of California sales volume to 50-state sales volume for the 2019-2021 model year period for each individual averaging set. This is further described in Chapter III, Section A.7.2 of this Staff Report.

For example, after reviewing its production records, assume a manufacturer determines that it produced 1,000 heavy-duty Otto-cycle engines for production in the U.S. (50-state production) during the 2019-2021 model year period. The same manufacturer also determines that 100 of those engines were actually distributed in the California market in the same 2019-2021 model year period. The ratio of California sales volume to 50-state production in this case is 10% (100/1,000). The manufacturer also examines its federal-ABT account and determines that it has accrued a total of 10 Megagrams (Mg) of NO_x credits in the 2010-2021 model year period. Based on the equation provided, the manufacturer can transfer 1 Mg (10% of the 10 Mg) of NO_x credits to the CA-ABT program. Thus, at the beginning of the 2022 model year, the manufacturer would have 9

Mg of NO_x credits in the federal-ABT program, and 1 Mg of credits in the CA-ABT program.

Subparagraph (f)

Purpose

The purpose of subparagraph (f) is to provide the mathematical equation for calculating emission credits for individual engine families or optionally certified hybrid powertrain families in the proposed CA-ABT program.

Rationale

This new subparagraph is necessary to show how emission credits for individual engine families will be calculated in the proposed CA-ABT program. The methodology to calculate emissions credits in CA-ABT is harmonized with the federal-ABT calculation methodology described in 40 CFR §86.004-15 (c)(1)(i), last amended October 6, 2000, and described in Chapter I, Section B.7.1 of this Staff Report. The family emission limit for the FTP cycle (FTP-FEL) is used for calculating the emissions credits in the CA-ABT program.

The credit calculation mechanism for the proposed CA-ABT would have some differences with the federal-ABT calculations. First, the applicable emission standards in California would be different than U.S. EPA emissions standards starting with the 2024 model year. Also, the applicable useful life requirements are increased starting in the 2027 model year. Finally, California sales volume would be used in the CA-ABT program, while the federal-ABT program would use the 49-State sales volume starting with the 2022 model year. All of these differences would necessitate the bifurcation of the current ABT program into separate CA-ABT and federal-ABT programs.

Subparagraph (g)

Purpose

The purpose of subparagraph (g) is to reinstate the shelf life requirement for emission credits generated in the proposed CA-ABT program. A proposed 5-year credit life requirement would be introduced starting in the 2022 model year. For example, credits generated in model year 2024 may be used to demonstrate compliance with emission standards only through model year 2029.

Rationale

This new subparagraph is necessary to establish a credit life limit of 5 years. The history of credit life requirements under the federal-ABT program is described in Chapter III, Section A.7.4 of this Staff Report. The credits in the federal-ABT program were subject to a 3-year credit life requirement before the 2004 model year. U.S. EPA removed this requirement in 2004 due to a request by the engine manufacturers. The rationale used by U.S. EPA was that their analysis showed that all federal-ABT credits will be used by 2010 model year. After reviewing the federal-ABT balances for all heavy-duty diesel

manufacturers, it is apparent that the assumption that all federal-ABT credits would be used by 2010 model year did not come to fruition.

As such, the CA-ABT program reinstates the credit life requirement to prevent the perpetuation of credits. The intent of the ABT program is to provide flexibility to manufacturers in the short term while they develop new technologies to reduce emissions. The 5-year credit life requirement is harmonized with the current requirements for the greenhouse gas ABT program for heavy-duty engines which is described in section 1036.740 of these test procedures.

Subparagraph (h)

Purpose

The purpose of subparagraphs (h)(1) to (h)(4) is to define the various applicable family emission limit (FEL) caps .

Rationale

The proposed amendments are necessary to establish guidelines on determining maximum NO_x and NMHC FEL values for different phases of the regulation, to prevent manufacturers from certifying products with high emission levels.

(1) For 2023 and previous model years, the maximum NO_x and NMHC FEL values (FEL caps) are specified in section I.11 of these test procedures.

(2) For 2024 through 2026 model years, the NO_x FEL cap would be set at 0.10 g/bhp-hr.

(3) For 2027 and subsequent model years, the NO_x FEL caps would be reduced. This would prevent the production of higher emitting engines in the California market.

(4) For 2024 and subsequent model years, the NMHC FEL cap would remain at the existing 0.30 g/bhp-hr level. The proposed amendments do not change the NMHC emissions standards; therefore, the previously established NMHC FEL caps (2023 and previous model years) would remain in effect.

Subparagraph (i)

Purpose

The purpose of subparagraphs (i)(1) to(i)(3) is to establish and define the heavy-duty zero-emission averaging set for NO_x only. Zero-emission vehicle manufacturers that certify 2022 through 2030 model year class 4 through class 8 zero-emission vehicle families would be eligible to generate NO_x credits in the heavy-duty zero-emission averaging set under the CA-ABT program.

Rationale

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As discussed further in Chapter III, Section A.7.5 of this Staff Report, the addition of this subparagraph is needed to establish the mechanism to award credits to zero-emission heavy-duty vehicle manufacturers starting with the 2022 model year. This proposed modification would help incentivize the development, production and distribution of HD-ZEVs in the California market. This would provide benefits in terms of both criteria emission reductions and greenhouse gas emission reductions, especially in the early years before they are required by the Advanced Clean Trucks regulation.

Subparagraph (i)(1) reaffirms the applicability of credit life provisions for credits in this averaging set.

Subparagraph (i)(2) provides the mathematical equation for calculating the NO_x credits generated by HD-ZEVs. The amount of credit is dependent on the vehicle class size. The larger vehicle classes have larger transient cycle conversion factor values. The mathematical equation for HD-ZEVs is similar to the credit equation for engine families, except that the HD-ZEVs have zero emissions, meaning that the FEL has a zero value.

Subparagraph (i)(3) terminates the heavy-duty zero-emission averaging set and all banked credits in this averaging set at the end of 2030 model year. Staff believes that after 9 years of development, production and distribution of HD-ZEVs, the technology would reach the point of maturity, and therefore an incentive mechanism would no longer be needed to support HD-ZEV production. The elimination of credits in this averaging set would assure that combustion engine technologies meeting the stringent 2031 and subsequent model year standards would be introduced.

The current ABT program is described in Chapter I, Section B.7 of this Staff Report; the need for changes to the ABT program is described in Chapter II, Section C.7.; and the description of proposed amendments, including for heavy-duty ZEVs, and their feasibility is included in Chapter III, Section A.7.

Subparagraph (j)

Purpose

The purpose of subparagraphs (j)(1) to (j)(4) is to describe the requirements to submit end-of-year reports if the manufacturer voluntarily participates in the CA-ABT program and the consequence of not complying with the reporting provisions.

Rationale

This new subparagraph is necessary to require manufacturers to submit end-of-year reports as part of the ABT program. It is essential to receive the end-of-year reports because manufacturers must demonstrate that they maintain a positive credit balance at the end of each model year. This is further described in Chapter I, Section B.7.1 of this Staff Report.

Negative credit balances must be remedied by procuring credits from other manufacturers. The regulatory language for subparagraphs (j)(1) to (j)(4) is structured

to be identical to the federal-ABT program reporting requirements as described in 40 CFR §86.098-23 (h)(3), last amended April 28, 2014.

Paragraph 3

Purpose

New Paragraph 3 provides the mechanism for generating early compliance credit multipliers for 2022 through 2030 model year engine families and optionally certified hybrid powertrains.

Rationale

As discussed further in Chapter III, Section A.7.6 of this Staff Report, the proposed addition of this paragraph is necessary to reward manufacturers that voluntarily certify engine families or hybrid powertrain families that meet future model year regulations with early compliance credit multipliers. This would incentivize early emission reductions by providing a mechanism to reward manufacturers for early compliance with future emission standards and would be available for engine families and hybrid powertrain families that are certified in the 2022 through 2030 model years.

Subparagraph (a)

Purpose

The purpose of subparagraph (a) is to provide the applicability mechanism for early compliance credit multipliers to 2022 through 2030 model year engine families and optionally certified hybrid powertrains.

Rationale

As discussed further in Chapter III, Section A.7.6 of this Staff Report, the proposed addition of this paragraph is necessary to reward manufacturers that voluntarily certify engine families or hybrid powertrain families that meet future model year regulations with early compliance credit multipliers. The program is structured to start with the 2022 model year when the CA-ABT program is established. The federal-ABT program does not have an equivalent mechanism. The program ends with the 2030 model year products, because 2031 model year is the last phase of the final emissions standards and useful life implementation.

Subparagraph (b)

Purpose

The purpose of subparagraph (b) is to provide the eligibility criteria for receiving early compliance credit multipliers.

Rationale

As discussed further in Chapter III, Section A.7.6 of this Staff Report, the eligibility criteria determination will be based on all elements of the future model year regulations. For example, a 2022 model year engine family can voluntarily be certified to 2024

model year requirements. In order to do so, the 2022 model year engine family must meet all 2024 model year requirements including: the emission standards, in-use compliance requirements, durability demonstration program requirements, warranty and useful life requirements, OBD requirements, etc. Credits generated by certifying to an FEL for this family will be increased by multiplying the generated credits with a 1.5 factor.

Subparagraph (c)

Purpose

The purpose of subparagraph (c) is to provide an equation to calculate, adjust, and bank credits for engine families and optionally certified hybrid powertrains that are eligible for early compliance credit multipliers.

Rationale

This new subparagraph basically defines how a multiplier concept will work. First, a manufacturer calculates the credits for each eligible engine family (or hybrid powertrain family). Next the generated credits will be multiplied by the applicable multiplier value. The methodology for applying the early compliance credit multipliers is described in Chapter III, Section A.7.

Subparagraph (d)

Purpose

The purpose of subparagraph (d) is to set forth the numerical values of early compliance credit multipliers.

Rationale

As discussed further in Chapter III, Section A.7.6 of this Staff Report, the proposed addition of this subparagraph is necessary to reward manufacturers that voluntarily certify engine families or hybrid powertrain families that meet future model year regulations with early compliance credit multipliers. In developing the numerical values for early compliance credit multipliers, staff considered the overall emissions benefits from developing and introducing new emission control technologies. Large multipliers were not considered because of the potentially adverse impacts on long-term emissions benefits.

Subparagraph (e)

Purpose

The purpose of subparagraph (e) is to set forth that credits generated from zero-emission vehicle families are not eligible for early compliance credit multipliers.

Rationale

This new subparagraph is necessary to inform manufacturers that multipliers are not applicable to HD-ZEVs. This is further discussed in Chapter III, Section A.7.6. The CA-

ABT program already introduces a new incentive mechanism to HD-ZEV manufacturers by allowing them to generate NOx emission credits in California starting with 2022 model year. Addition of multipliers to HD-ZEV NOx credits would lead to double counting of the newly introduced incentives and were deemed unnecessary.

21. Application for certification. [§86.xxx-21]

B. California provisions.

Paragraph 2

Purpose

Paragraph 2 would establish certification requirements for manufacturer that opt into the optional 50-state-directed engine emission standards program. It would require that a participating manufacturer submit a statement of compliance with the application for certification.

Rational

In the statement of compliance, the manufacturer would have to declare that all new Otto-cycle and diesel heavy-duty engine families produced by the manufacturer intended for sale in the United States in a given model year are certified to the optional 50-state-directed engine emission standards or lower with CARB and would conform with all the proposed associated certification requirements. The proposed statement of declaration is necessary to ensure the manufacturer has followed all the requirements necessary for certification. The statement would also be used to hold the manufacturer legally responsible for any violation or non-compliance with the 50-state-directed engine emissions requirements. The proposed 50-state-directed engine emission standards are described in section 1.1.1.2 of the Staff Report.

25. Maintenance. [§86.xxx-25]

A. Federal provisions

Paragraph 1

Purpose

The purpose of this amendment is to enumerate the changes that must be made to section 25 of these test procedures. In order for the federal minimum maintenance interval provisions for Otto-cycle engines in 40 CFR §86.004-25 can be meaningfully incorporated into the “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles,” to complement the longer, more representative warranty periods proposed in this rulemaking. Subparagraphs 1.1 through 1.14 of this paragraph explain these changes in detail.

Rationale

As discussed in Chapter III Section A.4.3 of the Staff Report, the proposed amendments to this paragraph 25 are specific to heavy-duty Otto-cycle engine minimum maintenance intervals, and are necessary to ensure that the emissions benefits of the proposed longer, more representative warranty periods are not circumvented by existing maintenance intervals. Maintenance intervals scheduled more frequently than necessary have the potential to reduce the effectiveness of the proposed longer warranty periods by voiding them should the vehicle owner delay performing the maintenance as scheduled. Longer minimum maintenance intervals, whether more representative of existing parts or indicative of future reengineering, are necessary to maintain the incentive of more timely repairs under warranty because vehicle owners are more likely to have the repairs performed if they don't have to pay for them (see Chapter I Section B.4 and Chapter III Section A.4.1.2 of the Staff Report). Timely repairs result in greater emissions reductions over time.

The current warranty requirements are described in Chapter I, Section B.4 through B.4.2. of this Staff Report; the need for amendments related to warranty is described in Chapter II, Section C.4 through C.4.2; and the description of proposed warranty amendments and their feasibility is included in Chapter III, Section A.4.

The particular necessities of these amendments are described below:

Subparagraph 1.1

Purpose

The purpose of this subparagraph is to describe maintenance requirements for specified emission-related components of this section. In particular, this subsection specifies the applicability of this section. The proposed amendment includes optionally certified Otto-cycle hybrid powertrains in the maintenance requirements.

Rationale

This amendment is necessary to include 2022 and subsequent model year Otto-cycle hybrid powertrains optionally certified pursuant to title 13, CCR §1956.8 in the maintenance requirements for heavy-duty vehicles. In addition, this amendment would clarify the maintenance requirements for specified emission-related components for heavy-duty Otto-cycle hybrid powertrain systems. These requirements align with those for heavy-duty Otto-cycle engines. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Subparagraph 1.2 defines a range of alignment with the federal definitions in 40 CFR §86.004-25 from subparagraph (a)(2) through (b)(3)(ii) for which no change is required. Previously this range extended from paragraph (a) in its entirety through subparagraph (6)(ii), but CARB staff is proposing to amend subparagraph (a)(1) to include applicability for hybrid powertrains and subparagraph (b)(3)(iii) to specify revised maintenance

schedules for Otto-cycle engines.

Subparagraph 1.3 adds a descriptive title to subparagraph (b)(3)(iii) to emphasize applicability to Otto-cycle heavy-duty engine maintenance intervals.

Subparagraph 1.4

Purpose

The purpose of this subsection is to specify the minimum maintenance interval requirements for specified emissions-related components, such as crankcase ventilation valves and filters, of this subsection. The proposed amendment makes optionally certified Otto-cycle hybrid powertrains subject to these requirements.

Rationale

This subparagraph deletes and replaces the remainder of subparagraph (b)(3)(iii) per the following rationale:

Subparagraph (b)(3)(iii) is specific to the minimum maintenance intervals for crankcase ventilation valves and filters, emissions-related hoses and tubes, ignition wires, idle mixture, and exhaust gas recirculation system-related filters and coolers. The proposed amendments to subparagraph (b)(3)(iii) incorporate text from 40 CFR §86.004 25 (b)(3)(iii), as of October 25, 2016, but with grammatical clarifications to improve readability and bifurcated requirements based on engine model year and GVWR. Bifurcating the requirement based on engine model year and GVWR is necessary to preserve the existing minimum maintenance intervals for 2026 and prior model year heavy-duty Otto-cycle engines while accommodating more representative maintenance intervals for engines used in vehicles greater than 14,000 GVWR beginning in 2027 and thereafter. Further, bifurcation is necessary to differentiate between the proposed maintenance requirements, which apply only to replacement or repairs, and the existing maintenance requirements, which continue to apply to adjustment and cleaning regardless of the model year of the engine. Although using separate subparagraphs (A) and (B) to better compartmentalize and isolate existing versus proposed future minimum maintenance intervals would have been ideal, separate subparagraphs (A) – (E) already exist to identify applicable emissions-related parts under subparagraph (b)(3)(iii), and changing them to incorporate this change could cause conflicts with other existing documents that reference them (see Chapter III Section A.4.3 of the Staff Report).

This subparagraph specifies the minimum (i.e., most frequent) emission-related maintenance intervals heavy-duty engine manufacturers are allowed to require for their Otto-cycle engines. CARB staff's amendments to this subparagraph to update the minimum repair and replacement maintenance intervals are necessary to prevent the existing intervals from inadvertently circumventing the emission benefits of the proposed lengthened warranty periods. Unless the minimum maintenance intervals increase in conjunction with the proposed lengthened warranty periods, the existing maintenance intervals could result in vehicle owners having to pay for scheduled replacements of

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expensive parts, such as catalytic converters, even when their vehicles are still within the lengthened warranty period. Having to pay out-of-pocket would be a disincentive for vehicle owners to fix emissions-related malfunctions in a timely manner, especially when those malfunctions do not dramatically affect vehicle performance (see Chapter I Section B.4 and Chapter III Section A.4.1.2 of the Staff Report).

The proposed amendments clarify the intent of the maintenance intervals as being the minimum allowable accumulation of hours/miles before which a manufacturer can schedule maintenance. Previously, the provision did not make it clear whether the stated intervals were obligatory for either maintenance or the minimum mileage accumulation at which maintenance could be scheduled, although the intent and application has always been as the minimum.

The provision's wording has also been restructured to leave the minimum maintenance intervals unchanged for 2026 or prior model year heavy-duty engines, and to lengthen the minimum maintenance intervals only for the repair or replacement frequency for 2027 and subsequent model year engines certified for use in vehicles with a GVWR greater than 14,000 pounds.

The proposed amendments further separate minimum maintenance intervals into cleaning/adjustment categories vs. repair/replacement categories. The cleaning/adjustment intervals remain unchanged for all heavy-duty engines, but the repair/replacement intervals for 2027 and subsequent model year heavy-duty engines certified for use in vehicles with a GVWR greater than 14,000 pounds would now reflect the most frequent maintenance intervals currently being scheduled by the on-road heavy-duty Otto-cycle industry as a whole. Subparagraph (b)(3)(iii) points to the newly proposed subparagraph (b)(3)(vi) for specific revised repair/replacement intervals for various components and systems (see Chapter III Section A.4.3 of the Staff Report). The amendments also make it clear that the proposed minimum maintenance intervals do not apply to parts identified in 1037.120 for heavy-duty vehicles certified to the GHG emission standards of section 95663, title 17, CCR. The maintenance provisions for the GHG-related parts in 1037.120 for heavy-duty vehicles certified to the GHG emission standards of section 95663, title 17, CCR, are specified in 1037.125 of that same section.

This amendment is also necessary to set the applicable minimum maintenance intervals, including adjustment or cleaning and repair or replacement intervals, for specified emission-related components for 2022 to 2026 model year Otto-cycle hybrid powertrains and 2027 and subsequent model year Otto-cycle hybrid powertrains optionally certified pursuant to title 13, CCR §1956.8. This amendment would clarify the minimum maintenance interval requirements and model year implementation schedules for specified emission-related components for heavy-duty Otto-cycle hybrid powertrain systems. These requirements align with those proposed for heavy-duty Otto-cycle engines. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed

powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Subparagraph 1.5

Purpose

The purpose of this subparagraph is to specify proposed, lengthened maintenance requirements for oxygen sensors of Otto-cycle engines. This proposed amendment includes optionally certified Otto-cycle hybrid powertrains in these requirements.

Rationale

This subparagraph deletes and replaces subparagraph (b)(3)(iv) per the following rationale:

Subparagraph (b)(3)(iv) is specific to the minimum maintenance intervals for oxygen sensors. The proposed amendments to subparagraph (b)(3)(iv) incorporate text from 40 CFR §86.004 25 (b)(3)(iv), as of October 25, 2016, but with grammatical clarifications to improve readability and bifurcated requirements based on engine model year and GVWR. Bifurcating the requirement based on engine model year and GVWR is necessary to preserve the existing minimum maintenance intervals for 2026 and prior model year heavy-duty Otto-cycle engines (proposed subparagraph (b)(3)(iv)(A)) while accommodating more representative maintenance intervals for engines used in vehicles greater than 14,000 GVWR beginning in 2027 and thereafter (proposed subparagraph (b)(3)(iv)(B)). Further, bifurcation is necessary to differentiate between the proposed maintenance requirements, which apply only to oxygen sensor replacement or repairs, and the existing maintenance requirements, which continue to apply to adjustment and cleaning regardless of the model year of the engine. Separate subparagraphs (A) and (B) were created to better compartmentalize and isolate existing versus future oxygen sensor minimum maintenance intervals (see Chapter III Section A.4.3 of the Staff Report).

This subparagraph specifies the minimum (i.e., most frequent) emissions-related maintenance intervals heavy-duty engine manufacturers are allowed to require for oxygen sensors on their Otto-cycle engines. CARB staff's amendments to this subparagraph to update the minimum repair and replacement maintenance intervals are necessary to prevent the existing intervals from inadvertently circumventing the emission benefits of the proposed lengthened warranty periods. Unless the minimum maintenance intervals for oxygen sensors increase in conjunction with the proposed lengthened warranty periods, the existing maintenance intervals could result in vehicle owners having to pay for scheduled replacements of oxygen sensors multiple times within the proposed lengthened warranty periods. Costly oxygen sensor maintenance during the warranty period would be a disincentive for vehicle owners to keep their engines properly maintained, especially when a malfunctioning maintenance item still allows the engine to be used, as is the case with a malfunctioning oxygen sensor, albeit with decreased fuel economy (see Chapter I Section B.4 and Chapter III Section A.4.1.2 of the Staff Report).

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The proposed amendments clarify the intent of the maintenance intervals as being the minimum allowable accumulation of hours/miles before which a manufacturer can schedule maintenance. Previously, the provision did not make it clear whether the stated intervals were obligatory for either maintenance or the minimum mileage accumulation at which maintenance could be scheduled, although the intent and application has always been as the minimum.

The provision's wording has also been restructured to leave the minimum maintenance intervals unchanged for 2026 or prior model year heavy-duty engines, and to lengthen the minimum maintenance intervals only for the repair or replacement frequency for 2027 and subsequent model year Otto-cycle engines certified for use in vehicles with a GVWR greater than 14,000 pounds.

The proposed amendments further separate oxygen sensor minimum maintenance intervals into cleaning/adjustment categories vs. repair/replacement categories. The cleaning/adjustment intervals remain unchanged for all heavy-duty engines, but the repair/replacement intervals for 2027 and subsequent model year heavy-duty engines certified for use in vehicles with a GVWR greater than 14,000 pounds would now reflect the most frequent maintenance intervals currently being scheduled by the on-road heavy-duty Otto-cycle industry as a whole. Subparagraph (b)(3)(v) points to the newly proposed subparagraph (b)(3)(vi) for specific revised repair/replacement intervals for various components and systems including oxygen sensors.

This amendment is also necessary to set the applicable minimum maintenance intervals for oxygen sensors for 2022 to 2026 model year Otto-cycle hybrid powertrains and 2027 and subsequent model year Otto-cycle engine powertrains optionally certified pursuant to title 13, CCR §1956.8. This amendment would clarify the frequency of manufacturer scheduled repair or replacement of the oxygen sensor requirements and model year implementation schedules for heavy-duty Otto-cycle engines hybrid powertrain system. These requirements align with those proposed for Otto-cycle heavy-duty engines. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Subparagraph 1.6

Purpose

The purpose of this subparagraph is to specify minimum maintenance requirements of this subsection for specified emissions-related components, such as catalytic converters. The proposed amendment includes optionally certified Otto-cycle hybrid powertrains into these requirements.

Rationale

This subparagraph deletes and replaces subparagraph (b)(3)(v) in order to specify the

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minimum maintenance intervals for catalytic converters, air injection system components, fuel injectors, electronic engine control units, evaporative emission canisters, turbochargers, carburetors, exhaust gas recirculation system valves and tubing. The proposed amendments to subparagraph (b)(3)(v) incorporate text from 40 CFR §86.004 25 (b)(3)(v), as of October 25, 2016, and are nearly identical to the proposed amendments to subparagraph (b)(3)(iii) of these test procedures as detailed in subparagraph 1.4 above, but for a different set of emissions-related parts and with grammatical clarifications to improve readability. Bifurcating the requirement based on engine model year and GVWR is necessary to preserve the existing minimum maintenance intervals for 2026 and prior model year heavy-duty Otto-cycle engines while accommodating more representative maintenance intervals for engines used in vehicles greater than 14,000 GVWR beginning in 2027 and thereafter. Further, bifurcation is necessary to differentiate between the proposed maintenance requirements, which apply only to replacement or repairs, and the existing maintenance requirements, which continue to apply to adjustment and cleaning regardless of the model year of the engine. Although using separate subparagraphs (A) and (B) to compartmentalize and isolate existing versus future minimum maintenance intervals would have been ideal, separate subparagraphs (A) – (H) already exist to identify applicable emissions-related parts under subparagraph (b)(3)(v), and changing them to incorporate this change could cause conflicts with other existing documents that reference them.

This subparagraph specifies the minimum (i.e., most frequent) emission-related maintenance intervals heavy-duty engine manufacturers are allowed to require for their Otto-cycle engines. CARB staff's amendments to this subparagraph to update the minimum repair and replacement maintenance intervals are necessary to prevent the existing intervals from inadvertently circumventing the emission benefits of the proposed lengthened warranty periods. Unless the minimum maintenance intervals increase in conjunction with the proposed lengthened warranty periods, the existing maintenance intervals could result in vehicle owners having to pay for scheduled replacements of expensive parts, such as catalytic converters, even when their vehicles are still be within the lengthened warranty period. Having to pay out-of-pocket would be a disincentive for vehicle owners to fix emissions-related malfunctions in a timely manner, especially when those malfunctions do not dramatically affect vehicle performance (see Chapter I Section B.4 and Chapter III Section A.4.1.2 of the Staff Report).

The proposed amendments clarify the intent of the maintenance intervals as being the minimum allowable accumulation of hours/miles before which a manufacturer can schedule maintenance. Previously, the provision did not make it clear whether the stated intervals were obligatory for either maintenance or the minimum mileage accumulation at which maintenance could be scheduled, although the intent and application has always been as the minimum.

The provision's wording has also been restructured to leave the minimum maintenance intervals unchanged for 2026 or prior model year heavy-duty engines, and to lengthen the minimum maintenance intervals only for the repair or replacement frequency for

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2027 and subsequent model year Otto-cycle engines certified for use in vehicles with a GVWR greater than 14,000 pounds.

The proposed amendments further separate minimum maintenance intervals into cleaning/adjustment categories vs. repair/replacement categories. The cleaning/adjustment intervals remain unchanged for all heavy-duty engines, but the repair/replacement intervals for 2027 and subsequent model year heavy-duty engines certified for use in vehicles with a GVWR greater than 14,000 pounds would now reflect the most frequent maintenance intervals currently being scheduled by the on-road heavy-duty Otto-cycle industry as a whole. Subparagraph (b)(3)(v) points to the newly proposed subparagraph (b)(3)(vi) for specific revised repair/replacement intervals for various components and systems (see Chapter III Section A.4.3 of the Staff Report). The amendments also make clear that the proposed minimum maintenance intervals do not apply to parts identified in 1037.120 for heavy-duty vehicles certified to the GHG emission standards of section 95663, title 17, CCR. The maintenance provisions for the GHG-related parts in 1037.120 for heavy-duty vehicles certified to the GHG emission standards of section 95663, title 17, CCR, are specified in 1037.125 of that same section.

This amendment is also necessary to set the applicable minimum maintenance intervals, including adjustment or cleaning and repair or replacement intervals, for specified emission-related components for 2022 to 2026 model year Otto-cycle hybrid powertrains and 2027 and subsequent model year Otto-cycle hybrid powertrains optionally certified pursuant to title 13, CCR §1956.8. This amendment would clarify the requirements for adjustment or cleaning frequency and repair or replacement frequency and model year implementation schedules for specified emission-related components for heavy-duty Otto-cycle hybrid powertrain system. These requirements align with those proposed for Otto-cycle heavy-duty engines. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Subparagraph 1.7

Purpose

The purpose of this subparagraph is to specify the proposed, lengthened minimum repair and replacement interval periods for specified emission-related components specified under this subparagraph. The proposed amendment includes optionally certified Otto-cycle hybrid powertrains into these requirements.

Rationale

This subparagraph adds new subparagraph (b)(3)(vi) to specify more representative minimum repair/replacement intervals for 2027 and subsequent heavy-duty Otto-cycle engines, and provides a table describing those intervals for the emissions-related parts covered. The intervals in the table were determined by CARB staff to be the shortest

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currently scheduled maintenance intervals for the indicated emissions-related parts by any manufacturer certifying heavy-duty Otto-cycle engines in California, as discussed in Chapter III Section A.4.3 of the Staff Report. With few exceptions as noted in the table, manufacturers do not currently schedule maintenance for these emissions-related parts during the entire current useful life period of 110,000 miles for heavy-duty Otto-cycle engines. Accordingly, the proposed revised minimum maintenance intervals as indicated in the table have been adjusted to equate to useful life in most cases. Although likely that maintenance intervals for these emissions-related parts could be longer than current useful life, data beyond useful life was not readily available for CARB staff to make that determination.

Additionally, the amendments prohibit the scheduling of repair or replacement maintenance for catalytic converter beds throughout the entire useful life of the engine. Whereas repair or replacement maintenance for the majority of the other emissions-related parts in the proposed table is prohibited prior to the current useful life mileage period of 110,000 miles (e.g., oxygen sensors), catalyst beds are held to a higher standard because of their importance in controlling emissions and because of their high cost of replacement. Therefore, manufacturers must design their catalyst beds to remain durable throughout the proposed useful life periods for heavy-duty Otto-Cycle engines in §86.004-2 “Useful Life” (3) of the “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles.” Otherwise, manufacturers must pay to repair or replace catalyst beds throughout the proposed useful life periods.

This amendment ensures more representative repair and replacement minimum maintenance intervals for emissions-related parts which are necessary to prevent existing maintenance intervals from inadvertently circumventing the emission benefits of the proposed lengthened warranty periods. Not revising the existing maintenance intervals could result in vehicle owners having to pay for scheduled replacements of expensive parts, such as catalytic converters, even when their vehicles are still within the lengthened warranty period. Having to pay out-of-pocket would be a disincentive for vehicle owners to fix emissions-related malfunctions in a timely manner, especially when those malfunctions may not dramatically affect vehicle performance (see Chapter I Section B.4 and Chapter III Section A.4.1.2 of the Staff Report).

The first occurring of any stated minimum maintenance interval in the table dictates the frequency by which the manufacturer is allowed to schedule maintenance for that part. Manufacturers would not be allowed to incorporate or modify measures of time or vehicle operation other than those specifically stated in the table when scheduling maintenance.

This amendment is also necessary to set the applicable minimum repair and replacement intervals for specified emission-related components for 2027 and subsequent model year Otto-cycle hybrid powertrains optionally certified pursuant to title 13, CCR §1956.8. This amendment would clarify the requirements for minimum repair and replacement intervals for specified emission-related components for heavy-

duty Otto-cycle hybrid powertrain system. These requirements align with those proposed for Otto-cycle heavy-duty engines. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Footnote 1 to the table in (b)(3)(vi):

This footnote clarifies that sensors and actuators that cannot be repaired without removing or replacing the exhaust gas recirculation system, turbocharger, or air induction system (i.e., integrated sensors and actuators) are subject to the same maintenance intervals as for the systems themselves as specified in subparagraph (b)(3)(vi) of the “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles.” Sensors and actuators that can be repaired or replaced without removing the exhaust gas recirculation system, turbocharger, or air induction system (i.e., non-integrated sensors and actuators), while still necessary for the proper emissions-critical functioning of these systems, are subject to the less-stringent maintenance intervals indicated for Electronic Control Units, Sensors, and Actuators in subparagraph (b)(3)(vi).

Footnote 2 to the table in (b)(3)(vi):

This footnote was added to clarify that manufacturers would not be allowed to schedule any repair or replacement maintenance for parts listed as “Not Replaceable” (i.e., catalytic converter beds). Manufacturers must either design their catalytic converter beds to be durable throughout the entire useful life of the engine, or else pay for any repair and replacement during useful life if the manufacturer requests to schedule maintenance and is approved to do so. The Executive Officer would approve or disapprove the manufacturer’s request to schedule maintenance according to the provisions in §86.004-25 (i) of the “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles.” These amendments to the test procedures are necessary to ensure that high-priced, emissions-critical catalytic converter beds are designed to be durable through useful life, or else that the manufacturer pays for replacements through useful life. Otherwise, the liability of replacement would be on the vehicle owner, thus disincentivizing the timely repair of malfunctioning, emissions-critical catalytic converter beds.

Footnote 3 to the table in (b)(3)(vi):

This footnote addresses the manner in which the maintenance intervals for add-on or new technology components will be administered. For such components, the default maintenance interval is the current useful life of the engine, i.e., 110,000 miles. Manufacturers may apply to the Executive Officer for shorter maintenance intervals, and the Executive Officer would evaluate the necessity and appropriateness of such intervals per the existing provisions in §86.094-25 (b)(7) of the “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles.”

Subparagraph 1.8 specifies the range of alignment with the federal provisions in 40 CFR §86.004-25 from (b)(4) through (b)(6)(ii)(F) for which no change is required.

Subparagraph 1.9 was renumbered for sequence (previously 1.2).

Subparagraph 1.10 was renumbered for sequence (previously 1.3).

Subparagraph 1.11 was renumbered for sequence (previously 1.4).

Subparagraph 1.12 was renumbered for sequence (previously 1.5) and defines a range of alignment with the federal definitions in 40 CFR §86.004-25 from paragraphs (c) through (h) for which no change is required. Previously, this range extended from paragraph (c) through (i), but CARB staff is proposing to amend subparagraph (i) to include applicability to heavy-duty Otto-cycle engine catalyst beds.

Subparagraph 1.13 deletes and replaces subparagraph (i) per the following rationale: The amendment to this subparagraph (i) is necessary to ensure that manufacturers are liable for replacing catalytic converter beds should the Executive Officer grant an exemption per the provisions in §86.094-25 (b)(7) allowing the manufacturer to schedule repair/replacement maintenance for catalytic converter beds during the useful life of the engine. The language in this subparagraph mirrors the text of 40 CFR §86.004-25(i), as of October 25, 2016, except that it extends applicability to the Otto-cycle provisions in subparagraph (b)(3) enabling manufacturers to schedule maintenance for catalytic converters if they agree to pay for the maintenance. Additionally, the amendment removes reference to diesel-specific particulate traps and NO_x adsorbers, adds reference to oxidation catalysts, and clarifies that catalytic converter “beds” specifically, are “Not Replaceable,” as opposed to entire catalyst systems being “Not Replaceable,” which makes the requirement consistent with previously adopted maintenance interval provisions for diesel engine SCR systems in §86.004-25 (b)(4)(iii)(F) of the “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles.” This proposed amendment clarifies federal and CARB requirements by codifying U.S. EPA and CARB’s longstanding practice of requiring manufacturers to pay to replace Otto-cycle catalytic converters throughout useful life (see Chapter III Section A.4.3 of the Staff Report).

30. Certification. [§86.xxx-30]

B. California provisions.

Paragraph 1

Purpose

This California provision was created to inform manufacturers that carryover or carry across applications would not be allowed for engine families or test groups that are not in compliance with in-use testing requirements, warranty reporting requirements, or are equipped with emission control components with failure rates that exceed corrective action thresholds for past model years and have not improved the components for the model year for which the application is submitted.

Rationale

Carryover and carry across applications use data from past model years in order to streamline the certification process for the current model year. In-use test data are necessary to assess the performance of vehicles and engines in the field. If a manufacturer does not comply with in-use testing requirements, it is not possible to determine if vehicles or engines are meeting emission standards throughout their useful life. It would not be reasonable to allow manufacturers to use old data if there is not any in-use test data proving that the vehicles or engines will comply with emission standards throughout useful life. Additionally, it would not be reasonable to allow for the use of data from past model years if warranty reports have not been submitted. Warranty data provides insights into the performance of in-use components. Without these data it will not be possible to determine if durability demonstrations performed during the time of certification were valid. Lastly, the use of data from past model years would not be allowed if the vehicles or engines are equipped with emission control components that have failure rates that exceed the corrective action threshold and an improved component is not being used for the upcoming model year. It would not be reasonable for CARB to certify an engine family or test group if CARB is aware that there is a systemic issue with a component for the same engine during past model years.

The current requirements related to emission warranty information and reporting are described in Chapter I, Section B.6; the need for emission warranty information and reporting clarifications and amendments is described in Chapter II, Section C.6; and the description of proposed emission warranty information and reporting clarifications and amendments is included in Chapter III, Section A.6.

35. Labeling. [§86.xxx-35]

B. California provisions.

Paragraph 3

Purpose

Proposed new addition paragraph 3 would require manufacturers that opt into the 50-state-directed engine emission standards program to label their engines stating that the engine conforms to California regulations and meets the 50-state-directed engine emission standards.

Rationale

Beginning with the 2024 model year engines and most likely until at least the 2026 model year, it is expected that California will have its own stringent exhaust emissions standards that are different than the federal standards. In addition, depending on whether the manufacturer certifies to the mandatory standards or the optional 50-state-directed engine emission standards, engines in California could be certified to meet different standards. Thus, there is a need for engines to be properly labeled and identified so that enforcement and compliance issues can easily be assessed. Compliance with the proposed labeling requirement would allow the identification of engines that have been certified to the 50-state-directed engine emission standards. The proposed 50-state-directed engine emission standards are described in section 1.1.1.2 of the Staff Report.

Paragraph 4

Purpose

The purpose of this paragraph is to specify the labeling requirements for Otto-cycle hybrid powertrains. The proposed amendment contains the statement that would be used on the label for optionally certified Otto-cycle hybrid powertrains.

Rationale

This amendment is necessary to require 2022 and subsequent model year Otto-cycle hybrid powertrains optionally certified pursuant to title 13, CCR §1956.8 to be subject to the labeling requirements as specified in this section. Emission control labeling is a requirement for every engine and vehicle certified for sale in California. Emission control labels provide essential engine and vehicle information for both repair technicians and enforcement officers. This amendment would align labeling requirements for Otto-cycle hybrid powertrains with heavy-duty Otto-cycle engines existing labeling requirements. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Subparagraph 4.1

Purpose

The purpose of this section is to include optionally certified Otto-cycle hybrid powertrains in the labeling requirements for the optional 50-state-directed emission standards of this section.

Rationale

This amendment is necessary to require 2024 through 2026 model year Otto-cycle hybrid powertrains optionally certified pursuant to title 13, CCR §1956.8 to be subject to the labeling requirements for the optional 50-state-directed emission standards as specified in section. This amendment would provide additional flexibilities for Otto-cycle hybrid powertrains that have been certified to the optional 50-state-directed emission standards to be allowed to be sold in California. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Part II. OTHER REQUIREMENTS; TEST PROCEDURES

Subpart N - Exhaust Test Procedures for Heavy-Duty Engines

86.1370. In-Use Test Procedures: Moving Average Window.

A. Federal Provisions

Paragraph 1

Purpose

The purpose of this amendment is to remove all references to NTE in-use testing from these test procedures for Otto-cycle engines because NTE testing does not apply to Otto-Cycle engines.

Rationale

This amendment is necessary to clarify that Otto-cycle heavy-duty engines are not now, nor have they ever been, subject to the NTE in-use testing requirements. Only heavy-duty diesel engines are subject to the in-use NTE testing requirements. The incorporated text from 40 CFR §86.1370 includes references to NTE because 40 CFR §86.1370 is inclusive of both diesel and Otto-cycle engines.

The current in-use test procedures are described in Chapter I, Section B.3 of this Staff Report; the need for amendments related to the HDIUT procedures is described in Chapter II, Section C.3; and the description of proposed HDIUT procedure amendments is included in Chapter III, Section A.3.

B. California Provisions

Paragraph 1

Purpose

The purpose of this amendment is to create a new Paragraph 1 introducing the moving average window (MAW) approach for in-use compliance for Otto-cycle engines beginning in 2024.

Rationale

This amendment is necessary because it provides a representative and reliable strategy for conducting in-use compliance testing of heavy-duty Otto-cycle engines. The advantage of a representative and reliable in-use compliance procedure is the ability to confirm that emissions are being adequately controlled during a greater portion of off-cycle activity, which is necessary in realizing the emission reduction benefits of the exhaust standards. MAW collects emissions data continuously into 300 second windows during off-cycle operating conditions. MAW correlates emissions data accumulation to fuel consumption (via CO₂ measurements) instead of relying on activity solely within a predetermined window of operation that may never be encountered. This

ensures a more comprehensive and predictable evaluation of emissions performance.

The current in-use test procedures are described in Chapter I, Section B.3 of this Staff Report; the need for amendments related to the procedures is described in Chapter II, Section C.3; and the description of proposed amendments is included in Chapter III, Section A.3.

Subparagraph 1.1

Purpose

The purpose of this amendment is to create a new Subparagraph 1.1 that defines the fundamental parameters of the MAW approach.

Rationale

This amendment is necessary because it identifies the pollutants to be evaluated as HC, CO, NO_x, and PM, specifies mass rate for measuring the pollutants, defines the length of each averaging window as 300 seconds, the time period of the moving average as 300 seconds, and the data sampling frequency as 1 Hertz.

The current in-use test procedures are described in Chapter I, Section B.3 of this Staff Report; the need for amendments related to the procedures is described in Chapter II, Section C.3; and the description of proposed amendments is included in Chapter III, Section A.3.

Subparagraph 1.2

Purpose

The purpose of this amendment is to create a new Subparagraph 1.2 identifying conditions for which data shall not be used in calculating MAW values. These exclusions are detailed in subparagraphs 1.2.1 through 1.2.6.

Rationale

This amendment is necessary to ensure that valid MAW testing occurs within the design tolerances of the portable emissions measurement instrumentation to ensure test to test repeatability and reliable emission measurements. Subparagraph 1.2.1 ensures that the portable emissions measurement system is properly calibrated and operating within acceptable parameters prior to the start of testing. Subparagraph 1.2.2 ensures that valid MAW testing does not occur when atmospheric pressure is less than 82.5 kPA, which typically occurs at higher altitudes where oxygen levels are significantly less than at sea level. Subparagraph 1.2.3 ensures that valid MAW testing does not occur when ambient temperatures are below 19 deg. F because air is denser at this temperature which can throw off fuel metering calibrations as well as measurement system linearity. Subparagraph 1.2.4 ensures that valid MAW testing does not occur at altitudes greater than 5,500 feet above sea level due to the potential for low oxygen levels and sensor nonlinearity. Heavy-duty vehicle operation in California is projected to occur infrequently above this altitude. Only Lassen National Park is situated above this

elevation. Subparagraph 1.2.5 ensures that valid MAW testing does not occur when ambient temperature exceeds 86 deg. F at an altitude of 5,500 feet above sea level or 100 deg. F at sea level. For altitudes between 5,500 feet above sea level and sea level, the maximum allowable temperature varies linearly between 86 deg. F and 100 deg. F. The maximum allowable ambient temperature for valid MAW testing in Death Valley California would be 101 deg. F. Excessive ambient temperatures can result in nonlinear measurements and possible fuel metering irregularities which can adversely affect reliable emission control system operation. Continuous heavy-duty vehicle operation in California is projected to occur infrequently at such high ambient temperatures. Subparagraph 1.2.6 and descendant subparagraphs 1.2.6.1 and 1.2.6.2 stipulate a temporary exclusion of validity for model years 2024 through 2026 for emission measurements sampled during cold starts when coolant temperature is below 158 deg. F, or prior to achieving a coolant temperature that does not vary more than +/- 3.6 deg. F over a five minute period. This temporary grace period provides manufacturers with additional lead time to calibrate their emission control systems to comply with the more stringent exhaust standards proposed for adoption in 2024 during cold start operation. Cold start operation remains a condition for determining a valid MAW test, as discussed later in Subparagraph 1.3.1 of this section, but data collected during such operating conditions shall not be used in calculating MAW test results until the 2027 model year.

The current in-use test procedures are described in Chapter I, Section B.3 of this Staff Report; the need for amendments related to the procedures is described in Chapter II, Section C.3; and the description of proposed amendments is included in Chapter III, Section A.3.

Subparagraph 1.3

Purpose

The purpose of this amendment is to create a new Subparagraph 1.3 defining the conditions for which a MAW test is considered valid. These conditions are detailed in subparagraphs 1.3.1 through 1.3.3.

Rationale

This amendment is necessary for ensuring that MAW testing occurs within the normal operating range of the engine being evaluated in order to generate meaningful test results. If one or more of the conditions in this subparagraph are encountered, then the entire MAW test is considered invalid and must be attempted at a different time. Subparagraph 1.3.1 identifies the parameters to be measured for conducting a valid MAW test including pollutants, exhaust flow rate, ambient temperature, humidity, OBD data stream elements, and engine coolant temperature. CO₂ has been added to the list of pollutants to be measured in order to segregate the data into discrete averaging sets, i.e. bins, but CO₂ itself is not being evaluated for compliance with a standard. The subparagraph also requires coolant temperature to be below 86 deg. F at the beginning of the test ensuring a cold start for the test to be valid. Subparagraph 1.3.2 stipulates that the duration of a valid MAW test must be for at least three hours not counting idle operation. A disproportionate amount of time operating at idle can skew test results,

especially if thermal management cannot be maintained for the exhaust aftertreatment because of extended low load (idling) operation resulting in poor overall emissions control. Subparagraph 1.3.3 stipulates that the average power expended by the vehicle's engine over the course of a test day must be at least 10 percent of the engine's peak power output for that test day for 2024 through 2026 MY engines. This is necessary to ensure that the vehicle has operated under sufficient loading during the MAW test to maintain thermal management of the aftertreatment systems for representative emissions control. The engine technologies expected in 2027 will provide improved thermal management capabilities over all duty cycles, and thus the need for setting a minimum average engine load at or above ten percent of engine's max power for in-use testing is no longer needed.

The current in-use test procedures are described in Chapter I, Section B.3 of this Staff Report; the need for amendments related to the procedures is described in Chapter II, Section C.3; and the description of proposed amendments is included in Chapter III, Section A.3.

Subparagraph 1.4

Purpose

The purpose of this amendment is to create a new Subparagraph 1.4 defining the period of a MAW Window as 300 seconds of valid data. The MAW Window is the principle averaging set in the MAW testing procedure.

Rationale

This amendment is necessary because it standardizes the time period of the MAW moving average at 300 second intervals. Each window consists of data sampled for 300 seconds and a moving average is calculated at 300 second intervals across all windows. The purpose of the moving average is to filter (smooth out) spurious data points which can bias MAW test results. Spurious data points are anomalies often caused by electrical interference or other types of noise introduced into the system that are not indicative of normal function. Therefore, the moving averaged data result in evaluations that are more representative of actual in-use emissions control than the raw data alone. For situations such as the inability to collect 300 valid seconds such as at the end of the vehicle test, windows not having 300 seconds of valid data will be invalidated.

The current in-use test procedures are described in Chapter I, Section B.3 of this Staff Report; the need for amendments related to the procedures is described in Chapter II, Section C.3; and the description of proposed amendments is included in Chapter III, Section A.3.

Subparagraph 1.5

Purpose

The purpose of this amendment is to create a new Subparagraph 1.5 describing the criteria for determining in-use compliance.

Rationale

This amendment is necessary to standardize the criteria for determining if an engine's emissions control system is performing acceptably during off-cycle operations. The mechanism for making this determination is the Sum-over-Sum (SOS) calculation which is calculated as the ratio of summed modal mass emissions for each pollutant, i.e., HC, CO, NO_x, and PM, to the summed modal mass emissions of CO₂, multiplied by the engine family's emission control level for CO₂ (in grams per second) as demonstrated over the FTP test cycle. The determination of compliance is made by comparing the SOS value for each pollutant to the threshold value. The threshold value is the applicable emission standard multiplied by a conformity factor of 1.5. The applicable emission standards are based on the FTP test cycle specified in 13, CCR, §1956.8 of the regulations. If the SOS value for each pollutant is less than or equal to the threshold value for each pollutant for each bin, then the engine is considered to be in compliance with the standards.

The current in-use test procedures are described in Chapter I, Section B.3 of this Staff Report; the need for amendments related to the procedures is described in Chapter II, Section C.3; and the description of proposed amendments is included in Chapter III, Section A.3.

PART 1036 – CONTROL OF EMISSIONS FROM NEW AND IN-USE HEAVY-DUTY HIGHWAY ENGINES

Subpart A – Overview and Applicability

1036.1 Does this part apply for my engines?

The proposed amendment updates the amendment date based on the U.S.EPA Phase 2 technical amendment date.

Paragraph 1

Purpose

The purpose of the proposed amendment is to include 2022 and subsequent model year Otto-cycle hybrid powertrains optionally certified to certified criteria pollutants emissions standards pursuant to title 13, CCR §1956.8 in the overview and applicability provisions of 40 CFR Part 1036.

Rationale

This amendment is necessary since although Part 1036 has provisions for testing hybrid powertrains, including certification testing specifications, those provisions are specific to GHG emissions. Without this amendment, Otto-cycle hybrid powertrains optionally certified to criteria pollutants emissions standards would not be able to use the provisions in this Part for certification testing of criteria emissions. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Paragraph 2

Purpose

The purpose of the proposed amendment is to specify that Part 1036 applies with respect to exhaust emission standards for NMHC, CO, NO_x, or PM for optionally certified Otto-cycle hybrid powertrains pursuant to title 13, CCR §1956.8.

Rationale

This amendment is necessary to have NMHC, CO, NO_x, and PM standards, which are considered criteria emission standards, to be applicable to Otto-cycle hybrid powertrain since this subparagraph states that engines/vehicles complying with Part 1036 does not have to comply with NMHC, CO, NO_x, or PM standards, due to the focus of Part 1036 on GHG. Without this amendment, Otto-cycle hybrid powertrains optionally certified to criteria pollutants emissions standards pursuant to title 13, CCR §1956.8 would not be able to use the provisions in this Part for certification testing to criteria pollutants emissions standards, which would render this optional certification testing not implementable. The current powertrain certification requirements are described in

Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

1036.5 Which engines are excluded from this part's requirements?

Paragraph 2

Purpose

The purpose of this paragraph is to describe the engines that are excluded from this part's requirements. The proposed amendment specifies that engines installed in an optionally certified Otto-cycle hybrid powertrains, whether the engines provide motive power or not, will be subject to the requirements of Part 1036 with respect to exhaust emission standards for NMHC, CO, NO_x, or PM.

Rationale

This amendment is necessary to subject optionally certified Otto-cycle hybrid powertrains to the requirements of this part. Without this amendment, an Otto-cycle engine that does not provide motive power, but otherwise is an integral and critical component in a properly functioning hybrid powertrain system, will not be subject to any requirements of this Part, but to other 40 CFR parts pertaining to auxiliary engines. Since optionally certified Otto-cycle hybrid powertrains would be certified as a system for heavy-duty on-road vehicle operation, the entire hybrid system, including the Otto-cycle engine, should be subject to the same certification requirements. If the Otto-cycle engines used in the hybrid powertrain are excluded from the requirements of Part 1036, it would significantly reduce the effectiveness of the certified Otto-cycle hybrid powertrain system since the Otto-cycle engine would be allowed to comply with different, and less stringent, requirements than the rest of the hybrid powertrains. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

1036.30 Submission of information

Paragraph 1

Purpose

Paragraph 1 provides CARB's designated person and address to whom the certifying manufacturer has to submit all reports and requests for approval. The proposed modification updates the Division name to Emissions Certification and Compliance Division and its address.

Rationale

APPENDIX F-B-2

This correction is necessary to provide the correct Division name and address to which the manufacturer submits reports.

Subpart B – Emission Standards and Related Requirements

1036.130 Installation instructions for vehicle manufacturers.

Paragraph 2

Purpose

The purpose of this paragraph is to provide installation instructions for vehicle manufacturers. The proposed amendment specifies that failure to follow the installation instructions for optionally certified Otto-cycle hybrid powertrains when installed in a heavy-duty motor vehicle would constitute a violation of federal and state law.

Rationale

This amendment is necessary to ensure vehicle manufacturers follow the installation instructions for installing Otto-cycle hybrid powertrains into their vehicles. Proper installation of the Otto-engine cycle hybrid powertrain is particularly needed due the increased complexity of the hybrid system compared to a conventional powertrain system, and this amendment would require the vehicle manufacturer to follow the installation instructions for the Otto-cycle hybrid powertrains as provided by the hybrid powertrain manufacturer. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

1036.135 Labeling.

Paragraph 1

Purpose

The purpose of this paragraph is to specify labeling requirements, and the proposed amendment includes optionally certified Otto-cycle hybrid powertrains in the labeling requirements of this section.

Rationale

This amendment is necessary to require 2022 and subsequent model year Otto-cycle hybrid powertrains optionally certified pursuant to title 13, CCR §1956.8 to be subject to the labeling requirements as specified in this section. Emission control labeling is a requirement for every engine and vehicle certified for sale in California. Emission control labels provide essential engine and vehicle information for both repair technicians and enforcement officers. This amendment would align labeling requirements for Otto-cycle hybrid powertrains with heavy-duty Otto-cycle engines existing labeling requirements. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the

description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

1036.140 Primary intended service class and engine cycle.

Paragraph 1

Purpose

The purpose of this paragraph is to describe how to identify the primary intended service class and engine cycle for certification. The proposed amendment requires manufacturers of optionally certified Otto-cycle hybrid powertrains to identify the specific primary intended service class for each hybrid powertrain family that is seeking certification.

Rationale

This amendment is necessary to specify that each Otto-cycle engine hybrid powertrain family will be certified to a single vehicle service class, the same as currently required for an engine family seeking certification. Without this amendment, a manufacturer would not be prohibited from certifying a single Otto-cycle hybrid powertrain family and allow it to be installed in all vehicle service classes. This would critically impact both the certified emission levels and fuel economy. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Subpart C – Certifying Engine Families

1036.205 What must I include in my application?

Paragraph 1

Purpose

The purpose of this paragraph is to specify the information that must be submitted in the certification application. The proposed amendment states that the requirements of this Subpart C, which describes the certification process for engine families, also apply to optionally certified Otto-cycle hybrid powertrains.

Rationale

This amendment is necessary in the introductory paragraph of this subsection to inform hybrid powertrain manufacturers that the certification requirements in Subpart C which pertain to certifying engine families also apply to the certification of Otto-cycle hybrid powertrains. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Paragraph 2

Purpose

The purpose of this paragraph is to specify the information that must be provided in the certification application. The proposed amendment applies these requirements to optionally certified Otto-cycle hybrid powertrains and specifies that, for such systems, all system components for controlling criteria pollutants emissions would also be included.

Rationale

This amendment is necessary to ensure that hybrid powertrain manufacturers know what information they need to submit as part of the application for certification for their Otto-cycle hybrid powertrains. Some of the required information include specifications and other basic parameters of the hybrid powertrain's design and emission controls, including all system components for controlling GHG and criteria pollutants emissions. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Paragraph 4

Purpose

The purpose of this paragraph is to specify the requirements to provide emission-related installation instructions for engines if someone else installs the engines. The proposed

amendment applies these requirements to optionally certified Otto-cycle hybrid powertrains.

Rationale

This amendment is necessary to ensure that Otto-cycle hybrid powertrain manufacturers provide emission-related installation instructions to vehicle manufacturers installing the hybrid powertrains. Vehicle manufacturers need to have detailed emission-related installation instructions so they can correctly install the Otto-cycle hybrid powertrain on their vehicles to ensure that it is installed correctly. This also ensures that the vehicle will operate properly and will not void any warranty provisions for the consumers. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Paragraph 6

Purpose

The purpose of this paragraph is to specify the requirements to identify deterioration factors for engines. The proposed amendment applies these requirements to optionally certified Otto-cycle hybrid powertrains.

Rationale

This amendment is necessary to ensure that Otto-cycle hybrid powertrain manufacturers identify deterioration factors and provide information on how those deterioration factors were developed for Otto-cycle hybrid powertrains. This information is necessary for hybrid powertrain manufacturers to conduct the durability demonstration testing to ensure that their Otto-cycle hybrid powertrains are durable over their useful life. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Paragraph 7

Purpose

The purpose of this paragraph is to specify the exhaust emission data requirements for criteria pollutant emissions. The proposed amendment requires Otto-cycle hybrid powertrains seeking to obtain certification to show compliance with the criteria pollutants emission standards.

Rationale

This amendment is necessary since the existing provisions of this subsection only require the manufacturers to provide exhaust emission for GHG emissions. Without this

amendment, no exhaust emissions of criteria pollutants would be required to be submitted and that would not allow the Otto-cycle hybrid powertrains that is seeking certification to criteria pollutants emission standards to be certified. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Paragraph 8

Purpose

The purpose of this paragraph is to state the certification limitation provisions of this paragraph that is currently placed on Otto-cycle engines. The proposed amendment includes optionally certified Otto-cycle hybrid powertrains in these provisions.

Rationale

This amendment is necessary to limit the scope of the certification to certain application(s) for which the Otto-cycle hybrid powertrain was tested. Limiting the scope of the applicability, as to which application(s) the certified hybrid powertrains may be installed in, would prevent the installation of the hybrid powertrain into inappropriate applications, which might negatively impact emissions and fuel economy. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Paragraph 9

Purpose

The purpose of this paragraph is to require the manufacturers to certify that all engines in the engine family are built as described and comply with all applicable requirements. The proposed amendment includes optionally certified Otto-cycle hybrid powertrains in these requirements.

Rationale

This amendment is necessary to ensure that Otto-cycle hybrid powertrain manufacturers only build products that comply with the requirements of the certification process. This amendment would prevent the situation where the manufacturer may build Otto-cycle hybrid powertrains that fall outside the scope of the system that was tested and demonstrated during the certification process. This would ensure that the Otto-cycle hybrid powertrains built by the manufacturers are able to comply with all emissions and in-use requirements. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

1036.210 Preliminary approval before certification.

Paragraph 1

Purpose

The purpose of this paragraph is to describe the preliminary approval process before certification. The proposed amendment includes optionally certified Otto-cycle hybrid powertrains in these requirements.

Rationale

This amendment is necessary to allow CARB to provide a preliminary approval for the Otto-cycle hybrid powertrains, if warranted, after review of the information provided by the manufacturers. This is the same allowance as currently provided for conventional engines and is intended to help manufacturers by shortening the time between the initial application and the final approval. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

1036.225 Amending my application for certification.

Paragraph 1

Purpose

The purpose of this paragraph is to describe the allowed process for amending the application during the certification process. The proposed amendment includes optionally certified Otto-cycle hybrid powertrains in these requirements.

Rationale

This amendment is necessary to provide a process for manufacturers of Otto-cycle hybrid powertrains to amend the application for certification, if needed, after the submittal of the original application. This is the same allowance as currently provided for conventional engines and is intended to help manufacturers to supplement the original application with additional information that are needed. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

1036.230 Selecting engine families.

Paragraph 1

Purpose

The purpose of this paragraph is to provide guidelines as to how a manufacturer divides its product line into families of engines for certification. The proposed amendment includes Otto-cycle hybrid powertrains in these requirements.

Rationale

This amendment is necessary to provide guidance for manufacturers of Otto-cycle hybrid powertrains on the criteria needed for selecting Otto-cycle hybrid powertrain families that are required in the application for certification. This amendment would help manufacturers decide what parameters to consider as well as how to select an Otto-cycle hybrid powertrain family for certification testing. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

1036.235 Testing requirements for certification.

Paragraph 1

Purpose

The purpose of this paragraph is to specify the emission testing requirements to show compliance with the GHG emission standards for conventional engines. The proposed amendment applies these requirements to optionally certified Otto-cycle hybrid powertrains as well as includes compliance requirements for criteria emission standards.

Rationale

This amendment is necessary in the introductory paragraph of this subsection to inform manufacturers of Otto-cycle hybrid powertrain that the testing requirements for certification that are currently set forth in this subsection as pertaining to engine family certification also apply to the certification of hybrid powertrains. Further, this amendment is also needed to specify that, in addition to GHG emissions, emission testing for Otto-cycle hybrid powertrain certification would also apply to criteria pollutants emissions, since the hybrid powertrain would be certified to criteria pollutants emissions standards. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Subpart E – In-use Testing

1036.401 In-use testing.

Paragraph 1

Purpose

The purpose of this paragraph is to specify that CARB may perform in-use testing of any engine family. The proposed amendment includes optionally certified Otto-cycle hybrid powertrains in this testing. .

Rationale

This amendment is necessary to provide enforcement capability for CARB to perform in-use testing on optionally certified Otto-cycle hybrid powertrains to ensure that the hybrid powertrains continue to be in compliance with the certified emission levels, including compliance with any other certification conditions. This amendment is needed to ensure that the Otto-cycle hybrid powertrain would operate as certified over its intended useful life. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Subpart F – Test Procedures.

1036.501 How do I run a valid emission test?

The proposed amendment updates the amendment date based on the U.S.EPA Phase 2 technical amendment date.

Paragraph 1

Purpose

The purpose of this paragraph is to specify the equipment and procedures that manufacturers will need to follow to run a valid emission test to determine whether engines meet the applicable emission standards. The proposed amendment includes optionally certified Otto-cycle hybrid powertrains in these requirements.

Rationale

This amendment is necessary to inform manufacturers of the required equipment to use and the procedures to follow to determine whether the Otto-cycle hybrid powertrains meet the applicable GHG and criteria pollutants emissions standards. This amendment would provide for a uniform and standardized process for manufacturers to use for emission testing. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Paragraph 3

Purpose

The purpose of this paragraph is to specify additional provisions for testing to demonstrate compliance with applicable emission standards for optionally certified Otto-cycle hybrid powertrains.

Rationale

This amendment is necessary to inform manufacturers of Otto-cycle hybrid powertrains the additional provisions they need to follow to demonstrate compliance with applicable GHG and criteria pollutants emissions standards. This amendment would provide similar provisions as currently in place for conventional engines. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Paragraph 5

Purpose

The purpose of this paragraph is to add criteria pollutants emissions as additional emission constituents that need to be measured for Otto-cycle hybrid powertrains when tested using the transient test cycle.

Rationale

This amendment is necessary to inform manufacturers of Otto-cycle hybrid powertrains the additional provisions they need to follow to demonstrate compliance with applicable criteria pollutants emissions standards. Without this amendment, manufacturers would not be able to certify their Otto-cycle hybrid powertrains to criteria pollutants emissions standards since those emission constituents are not currently required to be measured under this subsection. This amendment would provide similar requirements as currently in place for conventional engines and need to be included for Otto-cycle hybrid powertrains to ensure consistency with existing requirements for conventional engines. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Paragraph 7

Purpose

The purpose of this paragraph is to specify how to measure or calculate emissions of criteria pollutants for Otto-cycle hybrid powertrains.

Rationale

This amendment is necessary since the existing provisions of this Part only specify how to measure or calculate emissions of GHG emissions. As the amendment is to allow Otto-cycle hybrid powertrains to be certified to criteria pollutants emissions standards, it is necessary to inform manufacturers of hybrid powertrains what they need to do in order to measure or calculate criteria pollutants emissions in order to submit those emissions data for certification determination. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

1036.503 Engine data and information for vehicle certification.

Paragraph 1

Purpose

The purpose of this new paragraph is to describe engine data and information necessary for vehicle certification. The proposed amendment includes optionally certified Otto-cycle hybrid powertrains into the requirements of this section.

Rationale

This amendment is necessary to provide information on how vehicle manufacturers can certify model year 2021 and later vehicles. This amendment would extend the same requirements to manufacturers of 2022 and subsequent model year Otto-cycle hybrid powertrains to provide similar information as vehicle manufacturers on what they must follow to certify their vehicles. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

1036.510 Transient testing.

The proposed amendment updates the amendment date based on the U.S.EPA Phase 2 technical amendment date.

Purpose

The purpose of this amendment is to replace the existing section title, “Engine data and information for vehicle certification,” with the new title, “Transient testing”.

Rationale

This amendment is necessary to align with the U.S. EPA’s Phase 2 GHG technical amendments and to harmonized section titles for 40 CFR 1036.510. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

1036.527 Powertrain system rated power determination.

Purpose

The purpose of this amendment is to incorporate U.S. EPA’s new provision on powertrain system rated power determination as well as the amended date.

Rationale

This amendment is necessary to align with the U.S. EPA’s Phase 2 GHG technical amendments. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

1036.543 Carbon balance error verification.

Purpose

The purpose of this amendment is to incorporate a new U.S. EPA’s section that would address carbon balance error verification and to incorporate the amended date.

Rationale

This amendment is necessary to align with the U.S. EPA's Phase 2 GHG technical amendments. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Subpart G – Special Compliance Provisions

1036.601 What compliance provisions apply?

Paragraph 2

Purpose

The purpose of this paragraph is to described warranty-related prohibitions. The proposed amendment includes optionally certified Otto-cycle hybrid powertrains to this section.

Rationale

This amendment is necessary since the existing provisions for warranty-related prohibitions of this section only apply to manufacturers of heavy-duty highway engines. This amendment would extend the same requirements to manufacturers of Otto-cycle hybrid powertrains to provide identical warranty-related prohibitions requirements. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Subpart I – Definitions and Other Reference Information

1036.801 Definitions.

A. Federal Provisions.

The proposed amendment updates the amendment date based on the U.S.EPA Phase 2 technical amendment date.

B. California Provisions.

The amendments shown below affect the following existing definitions:

“Certificate of Conformity”

Purpose

The purpose of the definition is to state that a “Certificate of Conformity” means an Executive Order for engines. The proposed amendment includes optionally certified Otto-cycle hybrid powertrains in the definition.

Rationale

This amendment is necessary since the existing definition does not include optionally certified Otto-cycle hybrid powertrains to receive a Certificate of Conformity or Executive Order, which would not allow the Otto-cycle hybrid powertrains to be legally offered for sale in California. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

“Certification”

Purpose

The purpose of the definition is to describe what “Certification” means. The proposed amendment includes optionally certified Otto-cycle hybrid powertrains in the “Certification” definition.

Rationale

This amendment is necessary since the existing definition does not include optionally certified Otto-cycle hybrid powertrains in the “Certification” definition, relating to the process of obtaining an Executive Order to demonstrate that the Otto-cycle hybrid powertrain complies with applicable emission standards and requirements. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

“Hybrid powertrain”

Purpose

The purpose of this new definition is to describe a “Hybrid powertrain” and to further define this definition to include Otto-cycle hybrid powertrains.

Rationale

This amendment is necessary to include additional components that would be required to be grouped as a hybrid powertrain family for certification testing, which would be subject to all certification conditions and requirements. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

“Hybrid vehicle”

Purpose

The purpose of this new definition is to describe a “Hybrid vehicle” and to further define hybrid vehicle to include a vehicle that is installed with an optionally certified Otto-cycle hybrid powertrain.

Rationale

This amendment is necessary to specifically describe a vehicle installed with an Otto-cycle hybrid powertrain optionally certified pursuant to title 13 CCR section 1956.8 to be a “hybrid vehicle”. This amendment would provide clarity to the hybrid vehicle definition. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

“Manufacturer”

Purpose

The purpose of this definition is to describe a “Manufacturer.” The proposed amendment includes Otto-cycle hybrid powertrains to the list of products shown in the “Manufacturer” definition.

Rationale

This amendment is necessary since the existing definition does not represent a manufacturer, including importers, to be an entity that also manufactures or assembles, or import, Otto-cycle hybrid powertrains or vehicles for sale or resale in California. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is

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described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Appendix I to Part 1036 - Summary of Previous Emission Standards.

The proposed amendment updates the amendment date based on the U.S.EPA Phase 2 technical amendment date.

Purpose

The purpose of this amendment is to incorporate U.S. EPA's revisions to this section by changing the title of the Appendix, adding previous emission standards (incorporated by reference), and adding the amended date. In addition, the content of the existing Appendix I is moved to a new Appendix III.

Rationale

This amendment is necessary to align with the U.S. EPA's Phase 2 GHG technical amendments. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Appendix II to Part 1036 – Transient Duty Cycles.

Purpose

The purpose of this amendment is to incorporate U.S. EPA's revisions to this section by updating the amended date.

Rationale

This amendment is necessary to align with the U.S. EPA's Phase 2 GHG technical amendments. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

Appendix III to Part 1036 – Default Engine Fuel Maps for 40 CFR §1036.540.

Purpose

The purpose of this amendment is to incorporate U.S. EPA's revisions to this new appendix by renaming Appendix I to Appendix III and adding the amended date.

Rationale

This amendment is necessary to align with the U.S. EPA's Phase 2 GHG technical amendments. The current powertrain certification requirements are described in Chapter I, Section B.9 of this Staff Report; the need for amendments related to powertrain certification is described in Chapter II, Section C.9; and the description of proposed powertrain certification amendments and their feasibility is included in Chapter III, Section A.9.

PART 1065 – ENGINE-TESTING PROCEDURES.

Subpart A – Applicability and General Provisions

1065.514 Cycle-validation criteria for operation over specified duty cycles.

Purpose

The purpose of this amendment is to harmonize the cycle-validation criteria with the U.S. EPA phase 2 technical amendments.

Rationale

CARB will harmonize the procedures for cycle-validation criteria with the U.S. EPA's phase 2 technical amendment provisions.

**PART 1068 – GENERAL COMPLIANCE PROVISIONS FOR HIGHWAY,
STATIONARY, AND NONROAD PROGRAMS**

Subpart A – Applicability and Miscellaneous Provisions

1068.5. How must manufacturers apply good engineering judgement?

Purpose

Section 1068.5 describes the process for manufacturers on how to use good engineering judgment for decisions related to any requirements under this proposed regulation.

Rationale

The proposed amendment is necessary to describe the process to determine how good engineering judgement would be used by a manufacturer. Adoption of this section aligns CARB and U.S. EPA's processes for the practice of good engineering judgement. This includes how good engineering judgement would be used for manufacturers' applications for certification, any testing to show that their certification, production-line, and in-use engines/equipment comply with requirements that apply to them, and how they select, categorize, determine, and apply these requirements. Subparagraph (e) describes the fines that U.S. EPA uses in case of non-compliance. Since CARB has a different schedule for imposing non-compliance fines, subparagraph (e) was not included in the proposed amendments.