Appendix F-B-1

Purpose and Rationale for Proposed Amendments to the Diesel Test Procedures

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

Date of Release: June 23, 2020
Date of Hearing: August 27, 2020

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Cover Page

Purpose
The purpose of this amendment is to create a placeholder for the most recent date of amendment to the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles."

Rationale
This amendment is necessary to ensure that CARB staff's most recently amended version of these Test Procedures is properly referenced in the regulations. The proposed amended Test Procedures are a necessary complement to the proposed regulations for this rulemaking because the Test Procedures contain revised useful life periods and revised maintenance interval applicability that help to ensure the emission benefits of this rulemaking are fully realized.

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 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 Diesel 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 (l)(19) through (l)(21), 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. This 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 (see Chapter I Section B.5.3 of the Staff Report). 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. This all-inclusive applicability is also necessary to ensure the applicability of warranty periods based on full useful life periods, such as for catalyst beds, particulate filters, exhaust gas recirculation systems, and turbochargers, are applied as intended by these amendments.

Rationale
The proposed amendments to §86.004-2 are specific to heavy-duty diesel engine useful life periods. Heavy-duty Otto-cycle engine useful life periods are specified in the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle 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 diesel engines as it occurs in 40 CFR 86.004-2.

Subparagraph 1.2.1 identifies "Useful Life" subparagraphs (1), (2), and (3) as inapplicable to these test procedures because they apply to categories other than heavy-duty diesel engines. 40 CFR 86.004-2 is inclusive of light-duty trucks, vehicles, and Otto-cycle 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 Diesel Engines and Vehicles" only heavy-duty diesel engine useful life periods are applicable.

Subparagraph 1.2.2 deletes and replaces subparagraph (4) in its entirety while adhering to existing federal titles, paragraph structure, and numbering patterns to retain consistency and alignment throughout the document to the extent feasible.

Subparagraph (4)(i)(A) parallels the proposed useful life period definitions for light heavy-duty engines in 13 CCR 2112 subsection (*l*)(19)(A).

Purpose
The purpose of this amendment is to sunset the current useful life periods of 10 years and 110,000 miles for light heavy-duty diesel engines through the 2026 model year. Additionally, this amendment clarifies that light heavy-duty engines used in vehicles greater than 10,000 GVWR, but less than 14,000 GVWR are subject to useful life periods of 15 years and 150,000 for diesel engines used in medium-duty vehicles beginning with 2023 model year engines.

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 (4)(i)(B) and (4)(i)(C) beginning in 2027 and 2031, respectively, for light heavy-duty engines used in vehicles greater than 14,000 GVWR (see Chapter III Section A.5.1.1 of the Staff Report). Useful life periods determine the duration over which a light heavy-duty engine must maintain emissions at or below applicable standards. Manufacturers will use the lead time to reengineer emission-related parts, as necessary, to ensure that they are durable when the proposed useful life periods in subparagraphs (4)(i)(B) and (4)(i)(C) take effect. Current useful life periods apply only to the criteria emission standards carbon monoxide, particulate, and oxides of nitrogen plus non-methane hydrocarbons.

By definition, engines used in medium-duty vehicles are a subset of light heavy-duty diesel engines used in vehicles greater than 8,500 GVWR, but less than 14,000 GVWR. Light heavy-duty diesel engines are defined by use in vehicles greater than 8,500 GVWR, but less than 19,500 GVWR (see 13 CCR 1956.8(i)(5)). This amendment clarifies in subparagraph (4)(i)(D) that diesel engines used in vehicles greater than 10,000 GVWR, but less than 14,000 GVWR are subject to the useful life periods for medium-duty vehicles (15 years or 150,000 miles, whichever first occurs), beginning with the model year 2023. Useful life periods for diesel 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).

This amendment also bifurcates the original standalone subparagraph (4)(i) into subparagraphs (4)(i)(A) through (4)(i)(D) to compartmentalize current and proposed useful life period requirements for light heavy-duty engines according to implementation date and scope of applicability.

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 (4)(i)(B) parallels the proposed useful life period definitions for light heavy-duty engines greater than 14,000 GVWR in 13 CCR 2112 subsection (*l*)(19)(B).

Purpose
The purpose of this amendment is to adopt useful life periods of 12 years and 190,000 miles for 2027 through 2030 model-year light heavy-duty diesel 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 light heavy-duty diesel engines.

Rationale
This amendment is necessary to ensure that useful life periods for light heavy-duty diesel engines are representative of the actual service lives of modern heavy-duty vehicles up to 19,500 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 Chapter III Sections A.1 and 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. Oxides of nitrogen and non-methane hydrocarbons were previously listed together as a combined standard in the original subparagraph (4)(i), but are presented separately in this amendment to correspond to the latest round of standards which regulate the pollutants individually. This clarification does not affect applicability. 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 emission-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 (4)(i)(C) parallels the proposed useful life period definitions for light heavy-duty engines in 13 CCR 2112 subsection (*l*)(19)(C).

Purpose
The purpose of this amendment is to adopt useful life periods of 15 years and 270,000 miles for 2031 and subsequent model-year light heavy-duty diesel 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 light heavy-duty diesel engines.

Rationale
This amendment is necessary to ensure that useful life periods for light heavy-duty diesel engines are representative of the actual service lives of modern heavy-duty vehicles up to 19,500 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 Chapter III Sections A.1 and 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. Oxides of nitrogen and non-methane hydrocarbons were previously listed together as a combined standard in the original subparagraph (4)(i), but are presented separately in this amendment to correspond to the latest round of standards which regulate the pollutants individually. This clarification does not affect applicability. 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 emission-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 (4)(i)(D) parallels the proposed useful life period definitions for light heavy-duty engines in 13 CCR 2112 subsection (*l*)(19)(D).

Purpose
The purpose of this amendment is to clarify that light heavy-duty diesel 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 light heavy-duty diesel engines used in vehicles greater than 10,000 GVWR, but less than 14,000 GVWR. As previously noted, diesel engines used in medium-duty vehicles are a subset of light heavy-duty engines. Light heavy-duty engines are defined by use in vehicles greater than 8,500 GVWR, but less than 19,500 GVWR (see 13 CCR 1956.8(i)(5)) whereas medium-duty engines are defined by use in vehicles greater than 8,500 GVWR, but less than 14,000 GVWR (see 13 CCR 1900(b)(13)). Accordingly, light heavy-duty diesel engines used in vehicles greater than 10,000 GVWR, but less than or equal to 14,000 GVWR are not subject to the proposed useful life periods in (4)(i)(A), 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 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 (4)(ii)(A) parallels the proposed useful life period definitions for medium heavy-duty engines in 13 CCR 2112 subsection (*l*)(20)(A).

Purpose
The purpose of this amendment is to sunset the current useful life periods of 10 years and 185,000 miles for medium heavy-duty diesel engines through the 2026 model year.

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 (4)(ii)(B) and (4)(ii)(C) beginning in 2027 and 2031, respectively. Useful life periods determine the duration over which a medium heavy-duty engine must maintain emissions at or below applicable standards. Manufacturers will use the lead time to reengineer emission-related parts, as necessary, to ensure that they are durable when the proposed useful life periods in subparagraphs (4)(ii)(B) and (4)(ii)(C) take effect.

Current useful life periods apply only to the criteria emission standards carbon monoxide, particulate, and oxides of nitrogen plus non-methane hydrocarbons. Medium heavy-duty engines are defined as diesel engines used in vehicles greater than 19,500 GVWR, but less than or equal to 33,000 GVWR (see 13 CCR 1956.8(i)(6)).

This amendment also bifurcates the original standalone subparagraph (4)(ii) into subparagraphs (4)(ii)(A) through (4)(ii)(C) to compartmentalize current and proposed useful life period requirements for medium heavy-duty engines according to implementation date and scope of applicability.

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 (4)(ii)(B) parallels the proposed useful life period definitions for medium heavy-duty engines in 13 CCR 2112 subsection (*l*)(20)(B).

Purpose
The purpose of this amendment is to adopt useful life periods of 11 years and 270,000 miles for 2027 through 2030 model-year medium heavy-duty diesel engines. This amendment establishes the first of two phases of more representative useful life periods for medium heavy-duty diesel engines.

Rationale
This amendment is necessary to ensure that useful life periods for medium heavy-duty diesel engines are representative of the actual service lives of modern heavy-duty vehicles greater than 19,500 GVWR, but less than 33,000 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 Chapter III Sections A.1 and 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. Oxides of nitrogen and non-methane hydrocarbons were previously listed together as a combined standard in the original subparagraph (4)(ii), but are presented separately in this amendment to correspond to the latest round of standards which regulate the pollutants individually. This clarification does not affect applicability. 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 emission-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 (4)(ii)(C) parallels the proposed useful life period definitions for medium heavy-duty engines in 13 CCR 2112 subsection (*l*)(20)(C).

Purpose
The purpose of this amendment is to adopt useful life periods of 12 years and 350,000 miles for 2031 and subsequent model-year medium heavy-duty diesel engines. This amendment establishes the second (final) phase of more representative useful life periods for medium heavy-duty diesel engines.

Rationale
This amendment is necessary to ensure that useful life periods for medium heavy-duty diesel engines are representative of the actual service lives of modern heavy-duty vehicles greater than 19,500 GVWR, but less than 33,000 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 Chapter III Sections A.1 and 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. Oxides of nitrogen and non-methane hydrocarbons were previously listed together as a combined standard in the original subparagraph

(4)(ii), but are presented separately in this amendment to correspond to the latest round of standards which regulate the pollutants individually. This clarification does not affect applicability. 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 emission-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 (4)(iii)(A) parallels the proposed useful life period definitions for heavy heavy-duty engines in 13 CCR 2112 subsection (*l*)(21)(A).

Purpose
The purpose of this amendment is to sunset the current useful life periods of 10 years, 435,000 miles, and 22,000 hours for heavy heavy-duty diesel engines and urban buses using diesel engines through the 2026 model year.

Rationale
This amendment is necessary to provide manufacturers with sufficient lead time to transition to the longer, more representative useful life periods proposed in (4)(iii)(B) and (4)(iii)(C) beginning in 2027 and 2031, respectively. Useful life periods determine the duration over which a heavy heavy-duty engine must maintain emissions at or below applicable standards. Manufacturers will use the lead time to reengineer emission-related parts, as necessary, to ensure that they are durable when the proposed useful life periods in (4)(iii)(B) and (4)(iii)(C) take effect. Current useful life periods apply only to the criteria emission standards carbon monoxide, particulate, and oxides of nitrogen plus non-methane hydrocarbons. Although oxides of nitrogen and non-methane hydrocarbons are regulated independently under the most recent standards, the combined form as expressed in the federal regulations is retained for this provision to maintain alignment with current federal useful life periods, and because these useful life periods are sunsetting in 2026. Heavy heavy-duty engines are defined as diesel engines used in vehicles greater than 33,000 GVWR (see 13 CCR 1956.8(i)(4)).

This amendment also bifurcates the original standalone subparagraph (4)(iii) into new subparagraphs (4)(iii)(A) through (4)(iii)(C) to compartmentalize current and proposed useful life period requirements for heavy heavy-duty engines according to implementation date and scope of applicability. Original subparagraphs (4)(iv) and (4)(v) in 40 CCR 86.004-2 are relegated to dependent subordinate subparagraphs under subparagraph (4)(iii)(A) as (4)(iii)(A)(1) and (4)(iii)(A)(2), respectively, because under the federal language in 40 CFR 86.002-4 “Useful Life” (4) they could be misconstrued as standalone provisions applicable to all heavy-duty engines when in fact

they only apply to heavy heavy-duty engine useful life periods. A similar approach had been taken previously when CARB incorporated heavy heavy-duty useful life periods into 13 CCR 2112 to improve the clarity of the provision.

Subparagraph (4)(iii)(A)(1) maintains the requirement from original subparagraph (4)(iv) that an accurate and durable hours meter must be incorporated by the engine manufacturer as a prerequisite for being able to use hours of operation to limit useful life.

Subparagraph (4)(iii)(A)(2) maintains the existing requirement of fine tuning useful life based on how quickly the vehicle accumulates hours of operation, from original subparagraph (4)(v). This technique is designed to normalize manufacturer liability for applications that accumulate service miles slowly (e.g., urban buses, and vocational vehicles such as concrete mixers, refuse haulers and street sweepers, etc.), while simultaneously preventing applications that accumulate miles quickly (e.g., non-vocational vehicles such as line haul tractors, delivery vehicles, and furniture movers, etc.), from prematurely exceeding useful life periods. Accordingly, the provision in subparagraph (4)(iii)(A)(2) reduces the useful life miles period to 100,000 miles (from 435,000 miles) for engines that accumulate 22,000 hours of operation before reaching the 100,000 mile mark. In this case, hours would no longer be used to limit useful life. This technique establishes a more balanced determination of useful life for non-vocational applications that are likely to exceed the useful life mileage period relatively quickly because of frequent highway operation (higher average vehicle speed translates into quicker mileage accumulation). Accordingly, vocational vehicle manufacturers are not penalized with substantially longer useful life liability than non-vocational manufacturers for the same operational periods of use. The 100,000 mile limit is the warranty period in miles for 2027 through 2030 model year heavy-duty vehicles greater than 33,000 GVWR, which is analogous to the method employed in original subparagraph (4)(v).

The phrase “as required under Clean Air Act section 202(d) (42 U.S.C. 7521(d))” from original subparagraph (4)(v) was deleted from proposed subparagraph (4)(iii)(A)(2). The referenced section provides U.S. EPA with the authority to define useful life periods for heavy-duty engines, but is unnecessary because CARB’s authority to define useful life periods for heavy-duty engines in California is authorized in Health and Safety Code 43205.5(a).

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 (4)(iii)(B) parallels the proposed useful life period definitions for heavy heavy-duty engines in 13 CCR 2112 subsection (*l*)(21)(B).

Purpose

The purpose of this amendment is to adopt useful life periods of 11 years, 600,000 miles, and 30,000 hours for 2027 through 2030 model-year heavy heavy-duty diesel engines and urban buses using diesel engines. This amendment establishes the first of two phases of more representative useful life periods for heavy heavy-duty diesel engines.

Rationale

This amendment is necessary to ensure that useful life periods for heavy heavy-duty diesel engines are representative of the actual service lives of modern heavy-duty vehicles greater than 33,000 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 Chapter III Sections A.1 and 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. Oxides of nitrogen and non-methane hydrocarbons were previously listed together as a combined standard in the original subparagraph (4)(iii), but are presented separately in this amendment to correspond to the latest round of standards which regulate the pollutants individually. This clarification does not affect applicability. 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 emission-related parts, as necessary, when the second phase is fully implemented.

Subparagraph (4)(iii)(B)(1) carries forward the requirement from original subparagraph (4)(iv) that an accurate and durable hours meter must be incorporated by the engine manufacturer as a prerequisite for being able to use hours of operation to limit useful life. The language has been modified to clarify that the hours meter must both accurately record and report hours of operation and for improved readability. Further, to ensure that hours of operation are not accumulated during periods when the engine is not creating emissions, such as during standby mode in a stop-start system (key on, engine off), the amendment establishes a new requirement prohibiting manufacturers from incrementing the hours meter towards meeting the useful life period unless the engine is operating, i.e., using fuel.

Subparagraph (4)(iii)(B)(2) maintains the existing concept of fine tuning useful life based on how quickly the vehicle accumulates hours of operation, from original subparagraph (4)(v). This technique is designed to normalize manufacturer liability for applications that accumulate service miles slowly (e.g., urban buses and vocational vehicles such as concrete mixers, refuse haulers and street sweepers), while simultaneously preventing applications that accumulate miles quickly (e.g., non-vocational vehicles such as line

haul tractors, delivery vehicles, and furniture movers), from prematurely exceeding useful life periods. Accordingly, the provision in proposed subparagraph (4)(iii)(B)(2) reduces the useful life miles period to 450,000 miles (from 600,000 miles) for engines that accumulate 30,000 hours of operation before reaching the 450,000 mile mark. In this case, hours would no longer be used to limit useful life. This technique establishes a more balanced determination of useful life for non-vocational applications that are likely to exceed the useful life mileage period relatively quickly because of frequent highway operation (higher average vehicle speed translates into quicker mileage accumulation). Accordingly, vocational vehicle manufacturers are not penalized with substantially longer useful life liability than non-vocational manufacturers for the same operational periods of use. The 450,000 mile limit was chosen because it is the proposed warranty period in miles for 2027 through 2030 model year heavy-duty vehicles greater than 33,000 GVWR, which is analogous to the method employed in original subparagraph (4)(v).

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 (4)(iii)(C) parallels the proposed useful life period definitions for heavy heavy-duty engines in 13 CCR 2112 subsection (*l*)(21)(C).

Purpose
The purpose of this amendment is to adopt useful life periods of 12 years, 800,000 miles, and 40,000 hours for 2031 and subsequent model-year heavy heavy-duty diesel engines and urban buses with diesel engines. This amendment establishes the second (final) phase of more representative useful life periods for heavy heavy-duty diesel engines.

Rationale
This amendment is necessary to ensure that useful life periods for heavy heavy-duty diesel engines are representative of the actual service lives of modern heavy-duty vehicles greater than 33,000 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 Chapter III Sections A.1 and 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. Oxides of nitrogen and non-methane hydrocarbons were previously listed together as a combined standard in the original subparagraph (4)(iii), but are presented separately in this amendment to correspond to the latest round of standards which regulate the pollutants individually.

This clarification does not affect applicability. 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 emission-related parts, as necessary, when the second phase is fully implemented.

Subparagraph (4)(iii)(C)(1) carries forward the requirement from original subparagraph (4)(iv) that an accurate and durable hours meter must be incorporated by the engine manufacturer as a prerequisite for being able to use hours of operation to limit useful life. The language has been modified to clarify that the hours meter must both accurately record and report hours of operation and for improved readability. Further, to ensure that hours of operation are not accumulated during periods when the engine is not creating emissions, such as during standby mode in a stop-start system (key on, engine off), the amendment establishes a new requirement prohibiting manufacturers from incrementing the hours meter towards meeting the useful life period unless the engine is operating, i.e., using fuel.

Subparagraph (4)(iii)(C)(2) maintains the existing concept of fine tuning useful life based on how quickly the vehicle accumulates hours of operation, from original subparagraph (4)(v). This technique is designed to normalize manufacturer liability for applications that accumulate service miles slowly (e.g., urban buses and vocational vehicles such as concrete mixers, refuse haulers and street sweepers), while simultaneously preventing applications that accumulate miles quickly (e.g., non-vocational vehicles such as line haul tractors, delivery vehicles, and furniture movers), from prematurely exceeding useful life periods. Accordingly, the provision in proposed subparagraph (4)(iii)(B)(2) reduces the useful life miles period to 600,000 miles (from 800,000 miles) for engines that accumulate 40,000 hours of operation before reaching the 600,000 mile mark. In this case, hours would no longer be used to limit useful life. This technique establishes a more balanced determination of useful life for non-vocational applications that are likely to exceed the useful life mileage period relatively quickly because of frequent highway operation (higher average vehicle speed translates into quicker mileage accumulation). Accordingly, vocational vehicle manufacturers are not penalized with substantially longer useful life liability than non-vocational manufacturers for the same operational periods of use. The 600,000 mile limit was chosen because it is the proposed warranty period in miles for 2027 through 2030 model year heavy-duty vehicles greater than 33,000 GVWR, which is analogous to the method employed in original subparagraph (4)(v).

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 1.2.3 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 1.2.4

Purpose
The purpose of this subparagraph is to define the useful life periods and model year implementation schedules for 2022 and subsequent model year diesel 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 useful life periods and model year implementation schedules for 2022 and subsequent model year diesel 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 diesel 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 diesel hybrid powertrains would use for their hybrid powertrain systems. 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 diesel 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
A new definition is added to provide 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 emissions 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.

"Break-in period"

Purpose
This definition is added to provide a definition of "Break-in period" when used at the time of diesel engine certification as having a service accumulation period before an engine and aftertreatment system is stabilized for emissions-data testing.

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 proposed amendments. In paragraph I.26.B.1.2 of these test procedures, the proposed amendments change the default break-in period for diesel engines equipped with selective catalytic reduction (SCR) systems from 125 hours which was established before the introduction of aftertreatment systems, to 300 hours which is similar to off-road diesel engine regulations. This is further described in Chapter III, Section A.8.1 of this Staff Report.

"California sales volume"

Purpose
This definition is added to provide a definition of "California sales volume" as the number of new California certified heavy-duty engines or new heavy-duty 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 heavy-duty 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 calculation of NOx 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 that would be used in calculating the emissions in-use thresholds for heavy-duty in-use testing under the 3B-MAW test procedures described in §86.1370.B.6 of these test procedures. The multiplication of the conformity factor and the applicable emission standard equals the emissions in-use thresholds.

The current heavy-duty in-use test (HDIUT) 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.

“Family Certification Level or FCL”

Purpose
The purpose of this amendment is to create a new definition for the term “Family Certification Level or FCL.”

Rationale
This amendment is necessary because the FCL is a component in calculating normalized average carbon dioxide (CO_2) emissions as described in section

86.1370.B.6 of these test procedures. Normalized average CO_2 would be the metric used to categorize data windows into appropriate bins for heavy-duty in-use testing evaluations subject to the 3B-MAW test procedures.

The current HDIUT 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.

"Field fix"

Purpose
This definition is added to provide a description 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 (FTP, RMC, LLC) are described in Chapter I, Section B.2 of this Staff Report.

"Greenhouse gas emissions model (GEM)"

Purpose
This definition is added to define "GEM" for these amendments and to align with the California Phase 2 GHG regulation's GEM definition. The GEM model is a vehicle simulation model that uses specific vehicle and engine parameters as well as vehicle load and simulates the vehicle's operation over standardized heavy-duty chassis cycles to estimate greenhouse gas emissions performance of the vehicle. GEM is used as a certification tool to show compliance with the heavy-duty vehicle greenhouse gas emission standards. The GEM model could also be used to generate engine operation parameters such as engine speed and torque characteristics.

Rationale
As discussed in Chapter III, Sections A.8.2 and A.8.3 of this Staff Report, the addition of this definition is needed because manufacturers would be required to use the GEM model to determine the worst-case aging cycle for the durability demonstration program. The process and methodology are further described in Chapter III, Section A.8.2 of this Staff Report. Manufacturers would be required to run the GEM model to generate the engine dynamometer cycles for the applicable chassis cycles and compare them with the standard engine certification cycles. The worst-case durability cycle is the one with the highest load factor, as the higher load factor will lead to higher engine deterioration rates. This definition aligns with CARB's existing Phase 2 GHG regulation.

“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 §86.007-11(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. 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. Note that since §86.1360, which defines the testing conditions of the FTP cycle, is already incorporated by reference in the original test procedures, the proposed addition of this definition does not change the test cycle in any way, but merely names and defines the test.

“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 proposed 3B-MAW heavy-duty in-use test program described in section 86.1370.B.6 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 for the respective in-use bins: idle, low load, and medium/high load.

The current HDIUT 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.

“Low-hour”

Purpose
This new definition is added to provide a definition of “Low-hour” that means the emission test point after the break-in period at the time of engine certification.

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. The rationale for using the revised break-in period before low-hour emissions are measured is described in Chapter III, Section A.8.1 of this Staff Report.

"Low-load cycle (LLC)"

Purpose
This new definition is added to introduce the new low-load cycle (LLC) for certification. This additional certification cycle would be used as a metric to check the performance of the engine and aftertreatment system during stop and go, and low vehicle speed operations.

Rationale
As discussed further in Chapter III, Sections A.1.1.1 and A.1.1.2 of this Staff Report, the addition of this definition is needed to create a new low-load test cycle to ensure engines are tested using specified, fixed criteria and to ensure emissions reductions are occurring during stop and go as well as low vehicle speed operating conditions.

"Optional low NOx engine"

Purpose
The definition is modified to reference the proposed subparagraph I.11.B.7 of these test procedures, which contains 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, 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 subparagraph I.11.B.7 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 diesel hybrid powertrain or diesel hybrid powertrain or heavy-duty diesel hybrid powertrain"

Purpose

The proposed amendments introduce new emissions test procedures for hybrid powertrains as an optional pathway for certification. These two new definitions are used to describe the products that would be covered under this optional certification program.

Rationale
As part of the Phase 2 GHG technical amendments, U.S. EPA has introduced an optional pathway for certification of hybrid powertrains. This amendment is necessary to describe what is meant by "optionally certified hybrid powertrain or hybrid powertrain or heavy-duty diesel hybrid powertrain" and "optionally certified diesel hybrid powertrain or diesel hybrid powertrain or heavy-duty diesel hybrid powertrain" as used in these test procedures to establish a common understanding of the components that are considered to be comprised of a diesel hybrid powertrain system that is optionally certified to criteria pollutants emissions pursuant and greenhouse gas emissions 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, existing and proposed, utilize or would 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. PEMS are currently used to implement CARB's NTE heavy-duty in-use testing program described in section 86.1912 of these test procedures, and will also be used to implement the proposed 3B-MAW test program in section 86.1370.B.6.

The current HDIUT 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.

"Ramped Modal Cycle or RMC cycle"

Purpose
The definition is added to provide a consistent terminology of the "RMC" cycle with the existing federal definition specified in §86.1360, as last amended on October 25, 2016, which is incorporated by reference in these test procedures. Heavy-duty diesel engine manufacturers are required to perform emissions testing using the RMC cycle which represents steady-state highway operations.

Rationale
As discussed further in Chapter III, Section A.1.1.1 of this Staff Report, this definition is needed to establish the specific description of the RMC cycle, because this test cycle is used in the proposed certification emission standards tables. Note that since §86.1360, which defines the testing conditions of the RMC cycle, is already incorporated by reference in the original test procedures, the proposed addition of this definition does not change the test cycle in any way, but merely names and defines the test.

"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 term 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 (FTP, RMC, LLC) are described in Chapter I, Section B.2 of this Staff Report.

"Test procedure"

Purpose
This new definition is added to define "Test procedure" as having all aspects of engine testing including but not limited to the duty cycle, preconditioning procedures, equipment specifications, calibrations, calculations and other protocols, and specifications needed to measure emissions.

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 and incorporated references. The term "test procedure" is used in many parts of the regulatory language and this Staff Report including Chapter III, Sections A, A.1.1.1.2, A.1.1.3, A.3, etc.

"Vehicle family"

Purpose
This new definition is added to define "Vehicle family" for this regulation and 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," "Vehicle-LLC," and "Vehicle-RMC"

Purpose
These new definitions are added to provide definitions of the "Vehicle-FTP," "Vehicle-LLC," and "Vehicle-RMC" cycles.

Rationale
These definitions are needed to set forth the meaning of these terms in determining the suitable vehicle duty cycles for the optional certification pathway applicable to hybrid powertrains. These chassis cycles are expected to yield the same engine torque and speed profiles as the standard engine certification cycles. These cycles would be used for certification of diesel hybrid powertrains as described in Chapter III, Section A.9 of this Staff Report. Additionally, the Vehicle-FTP cycle would be 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
A new definition is added to provide a definition of "Zero-emission vehicle" as having a drivetrain that produces zero exhaust emission of any criteria pollutant (or precursor pollutant) or greenhouse gas 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 heavy-duty zero-emission vehicle 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]

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.

"3B-MAW"

Purpose
The purpose of this amendment is to add the acronym "3B-MAW" to the test procedures, which stands for "3-Binned Moving Average Window."

Rationale
This amendment is necessary because the acronym "3B-MAW" is used repeatedly in the test procedures with respect to the proposed 3B-MAW method for performing in-use testing of heavy-duty engines described in §86.1370.B.6 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 3B-MAW method also continuously averages data collected in 300 second intervals, but categorizes those data into one of three bins ensuring a more reliable way to identify failures that happen only during certain operating conditions, but not at others. An example would be poor NOx control during low-load operation where keeping SCR devices at operating temperature has been challenging for some manufacturers.

The current HDIUT 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.

"55-cruise" and "65-cruise"

Purpose
New abbreviations are added for "55-cruise" and "65-cruise" for chassis cycles and to align with the California Phase 2 GHG regulation's definitions.

Rationale
As discussed further in Chapter III, Section A.8.2 of this Staff Report, the addition of these abbreviations is needed to generate the applicable chassis cycles for 55-cruise

and 65-cruise cycles using Phase 2 GEM and compare them with the standard engine certification cycles (RMC). These abbreviations would align with CARB's existing Phase 2 GHG regulation.

"CA-ABT"

Purpose
This new abbreviation is added of "CA-ABT" to indicate the California ABT program, as opposed to the federal program. 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 California-only averaging, banking, and trading set (CA-ABT). Furthermore, the proposed NOx and PM emissions standards 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 and PM in 2024 model year, thus the current ABT accounting mechanism would no longer be sustainable. 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.

"EAS"

Purpose
This new abbreviation is added for "EAS" which means the combination of the engine, aftertreatment system and electronic control unit when used and functioning together at the time of engine certification.

Rationale
The EAS abbreviation is used in many different parts of the test procedures. These include various sections of I.26.B, including: Figures CA26-1, CA26-2 and CA26-3. The addition of this abbreviation is needed to establish a specific description and to maintain consistency in how this new terminology is used among manufacturers for compliance with the proposed amendments. This abbreviation is also used in Chapter III, Section A.8.2 of this Staff Report.

"HDTT"

Purpose

A new abbreviation is added for “HDTT”, the heavy-duty transient test, for chassis cycles and to align with the California Phase 2 GHG regulation’s definitions.

Rationale
As discussed further in Chapter III, Section A.8.2 of this Staff Report, the addition of this abbreviation is needed to generate the applicable chassis cycle for the HDTT cycle using Phase 2 GEM and compare it with the standard engine certification cycle (FTP). This abbreviation would align with CARB’s existing Phase 2 GHG regulation.

11. Emission standards for diesel heavy-duty engines and vehicles. [§86.xxx-11].

A. Federal provisions.

Paragraph 2 - §86.007-11.

Subparagraph 2.2

Purpose
Section 86.007-11 contains the applicable emission standards and requirements for 2007 and later model year heavy-duty diesel engines and vehicles. Subparagraph (a)(1) is modified to establish current applicable exhaust emission standards for only new 2007 through 2023 model year diesel heavy-duty engines including engines used in urban buses and to indicate that the standards for new 2024 and later model year heavy-duty engines, including for engines used in urban buses, are in subparagraph I.11.B. The proposed modification also includes amending the section numbering because of the added new subparagraphs.

Rationale
As discussed in detail in Chapter III, Section A.1 of the Staff Report, CARB staff is proposing new tailpipe NOx and PM exhaust emissions standards applicable to 2024 and subsequent model year engines. These new standards apply only to California certified engines and therefore are specified under the California Provisions in subparagraph I.11.B of these test procedures. These modifications are necessary in order to continue to certify new 2007 through 2023 model year heavy-duty diesel engines to the current standards as specified in subparagraph 2.2 by referencing to 40 CFR 86.007-11 and to direct readers to the proposed California exhaust emissions standards for new 2024 and subsequent model year diesel heavy-duty engines in subparagraph I.11.B. In addition, the changes clarify the urban bus engine requirements and make them consistent with the urban bus engine requirements in title 13, CCR, section 1956.8 (see also purpose and rational for changes made to 86.007-11.B.1, below). These standards, in combination with the certification procedures, are necessary to establish a process to certify these engines.

The current emission standards are described in Chapter I, Section B.1 of this Staff Report; the need for emission standard amendments is described in Chapter II,

Sections C.1. and C.2.; and the description of proposed amendments and their feasibility is included in Chapter III, Sections A.1 and A.2.

Subparagraph 2.7

Purpose
Section 86.007-11 contains the applicable emission standards and requirements for 2007 and later model year heavy-duty engines and vehicles. Subparagraph 2.7 is modified to specify that engines installed in new glider vehicles are subject to the standards specified in 40 CFR 1037.635 as modified by the California Greenhouse Gas Exhaust Emission Standards and Test Procedures for 2014 and Subsequent Model Heavy-Duty Vehicles.

Rationale
The modification is needed to establish specific guidelines for engines installed in new glider vehicles. A glider kit consists of a chassis for a tractor-trailer with a frame, front axle, interior and exterior cab, and brakes. It becomes a glider vehicle when an engine, transmission, and rear axle are added. Engines are often salvaged from earlier model year vehicles, remanufactured, and installed in the glider kit. This modification provides emissions standards that engines installed in glider vehicles have to comply with and references 40 CFR 1037.635. This proposed modification aligns with CARB's existing Phase 2 GHG regulation and would maintain consistency among manufacturers for compliance with the proposed amendments.

B. California provisions.

Paragraph 1 - Urban Bus Standards.

Subparagraph 1.3

Purpose
Section 86.007-11 currently contains the applicable emission standards and requirements for 2007 and later model year heavy-duty engines including engines used in urban buses. Subparagraph 1.3 is deleted because the exhaust emission standards for new 2007 and later model year urban bus engines are being moved to subparagraph 2.2 as previously discussed.

Rationale
The proposed deletion is necessary because the urban bus exhaust emission standards specified in this section are not consistent with the 2007 and subsequent model year urban bus exhaust emission standards specified in title 13, CCR, Section 1956.8(a)(2)(A). Starting with the 2007 model year, emissions standards for engines used in urban buses have been aligned with the heavy-duty engine standards and, since then, manufacturers have been certifying urban bus engines to the same standards as other heavy-duty engines. Adding the word "urban bus" in section 86.007-11, subparagraph 2.2 and deleting the table in section 1.3 would rectify this

inconsistency between urban bus standards in title 13, CCR, Section 1956.8(a)(2)(A) and these test procedures. This action does not change the stringency of the standards and test procedures to which urban buses are currently required to certify.

Paragraph 5 - Standards for Heavy-Duty Engines

Purpose
The purpose of changing the title of Paragraph 5 is to define new standards for heavy-duty engines. The word “medium” is deleted from the title and “heavy” is added to the title to enable a new table of proposed standards applicable to heavy-duty engines to be added under paragraph 5.

Rationale
Medium-duty engines are a subcategory of heavy-duty engines. Title 13, CCR, Section 1900 defines heavy-duty engine as an engine which is used to propel a heavy-duty vehicle with GVWR greater than 8,500 pounds, while subparagraph 86.012-2.B of this test procedure defines a medium-duty engine as a heavy-duty engine used to propel a medium-duty vehicle with GVWR less than 14,000 pounds. Because medium-duty engines are a subset of heavy-duty engines, the existing medium-duty standards included in Paragraph 5 are still appropriately located, even with the new title. Furthermore, changing the word “medium” to “heavy” in the title would allow consolidation of exhaust emission standards for heavy-duty engines, including medium-duty engines in one section.

Subparagraph 5.3 Title

Purpose
The word “medium” is deleted from the title and “heavy” is added to the title since these standards are for heavy-duty engines.

Rationale
This proposed modification is necessary to specify the proposed standards for heavy-duty engines. As explained above in the rationale for paragraph 5, medium-duty engines are a subcategory of heavy-duty engines and thus the title is still inclusive of medium-duty engines. Changing the word “medium” in the title to “heavy” would also allow a table of proposed heavy-duty engines standards to be added under subparagraph 5.3.

Subparagraph 5.3.1

Purpose
Subparagraph 5.3.1 specifies the exhaust emission standards from new 2004 through 2019 model heavy-duty diesel engines used in ultra-low emission and super-ultra-low emission medium-duty diesel vehicles 8,501 to 10,000 pounds GVWR and 2004 through 2023 model heavy-duty diesel engines used in ultra-low emission and super-ultra-low emission medium-duty diesel vehicles 10,001 to 14,000 pounds GVWR. “2023

model year" is added to require that heavy-duty diesel engines used in ultra-low emission and super-ultra-low emission medium-duty diesel vehicles 10,001 to 14,000 pounds GVWR are only applicable through 2023 model year. Finally, the proposed modification also includes adding a subparagraph numbering because of the added new subparagraphs in this paragraph 5.

Rationale
Since CARB staff is proposing new engine standards applicable to 2024 and subsequent model year engines, the proposed modification of adding the phrase "through 2023 model year" is necessary to define the model year applicability of existing standards for medium-duty engines used in vehicles with GVWR between 8,501 to 14,000 pounds.

Subparagraph 5.3.2

Purpose
New subparagraph 5.3.2 specifies the proposed exhaust emission standards for new 2024 and subsequent model year diesel engines used in medium-duty vehicles 10,001 to 14,000 pounds GVWR.

Rationale
As discussed further in Chapter III, section A.1 for NOx and section A.2 for PM of this Staff Report, these modifications are necessary in order to establish proposed California exhaust emission standards for new 2024 and later model year heavy-duty diesel engines used in medium-duty vehicles 10,001 to 14,000 pounds GVWR.

The proposed 2024 model year California NOx emission standards would reduce NOx by 75 percent from current FTP standards. The proposed 2024 LLC standard is a new standard designed to control emissions during low load and low speed operations which are currently not controlled because SCR aftertreatment is not effective under low load and low speed driving. The 2024 model year standards are feasible with improvements in engine calibration and modern generation of aftertreatment systems.

Certification data indicate most engines have PM certification levels well below the current 0.01 g/bhp-hr PM standard and certify close to 0.001 g/bhp-hr. A lower PM standard of 0.005 g/bhp-hr is proposed to prevent backsliding and maintain current robust PM emission control performance at 0.001 g/bhp-hr levels. The proposed PM standard is feasible with current PM filters. These standards, in combination with the certification procedures, are necessary to establish a process to certify these engines.

Furthermore, the proposed footnote A to the table would continue to provide manufacturers the existing flexibility to certify engines used in 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 engine 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
The current emission standards are described in Chapter I, Section B.1 of this Staff Report; the need for emission standard amendments is described in Chapter II, Sections C.1. and C.2.; and the description of proposed amendments and their feasibility is included in Chapter III, Sections A.1 and A.2.

Subparagraph 5.3.3

Purpose
New subparagraph 5.3.3 is added to specify proposed new exhaust emission standards for new 2024 and subsequent model light heavy duty engines used in vehicles 14,001 to 19,500 pounds GVWR, medium heavy-duty engines used in vehicles 19,501 to 33,000 pounds GVWR, and heavy heavy-duty engines used in vehicles above 33,000 pounds GVWR, including urban bus engines.

Rationale
As discussed further in Chapter III, sections A.1, A.2, and A.5 of this Staff Report, these modifications are necessary in order to establish proposed California exhaust emission standards for new 2024 and later model year heavy-duty diesel engines intended for use in vehicles with GVWR greater than 14,000 pounds. Heavy-duty diesel engines are subdivided into three subcategories designated as light-heavy duty diesel engines (LHDDE) intended for use in vehicles less than or equal to 19,500 pounds GVWR, medium-heavy duty diesel engines (MHDDE) intended for use in vehicles 19,501 to 33,000 pounds GVWR, and heavy-heavy duty diesel engines (HHDDE) intended for use in vehicles 33,001 pounds and greater GVWR.

For 2024 through 2026 model years, the same numerical standards would apply for all the heavy-duty engine categories. Furthermore, a new standard over the LLC test procedure designed to control emissions at low loads is introduced for the first time beginning with the 2024 model year engines. A lower PM standard of 0.005 g/bhp-hr is also proposed to prevent backsliding and maintain current robust PM emission control performance at 0.001 g/bhp-hr levels.

For 2027 and subsequent model year heavy-duty engines, CARB is proposing more stringent emission standards for all heavy-duty diesel classes. The proposed emission standards will vary depending on the applicable diesel engine service class. For 2027 and subsequent model year HHDDEs, CARB is proposing an intermediate useful life NOx emission standard at 10 years/435,000 miles/22,000 hours, and another NOx emission standard at useful life. Manufacturers will have to meet the applicable standard based on the vehicle/engine mileage or years/hours of service.

The current emission standards are described in Chapter I, Section B.1 of this Staff Report; the need for emission standard amendments is described in Chapter II, Sections C.1. and C.2.; and the description of proposed amendments and their feasibility is included in Chapter III, Sections A.1 and A.2.

Subparagraph 5.4

Purpose
Subparagraph 5.4 describes the existing optional standards for complete and incomplete heavy-duty diesel vehicles. “2023 model year” is added to indicate that the existing optional standards for complete and incomplete heavy-duty diesel vehicles apply only up to the 2023 model year.

Rationale
Since CARB staff is proposing new standards for 2024 and subsequent model year complete and incomplete heavy-duty diesel vehicles, the proposed modifications are necessary to inform manufacturers and define the model year applicability of existing optional standards.

Subparagraph 5.5 and Subparagraphs 5.5.1 through 5.5.6

Purpose
New subparagraph 5.5 describes an option for 50-state-directed engine emission standards for new 2024 through 2026 model year diesel heavy-duty engines. The proposed optional 50-state-directed engine standards are specified in new subparagraph 5.5.1. New subparagraphs 5.5.2 through 5.5.6 specify the additional conditions that a manufacturer would have to meet in order to participate in this optional program.

Rationale
As discussed further in Chapter III, Section A.1.1.2. of this Staff Report, the proposed amendments include provisions that would allow manufacturers to certify 2024 through 2026 model year engines to an optional standard that is less stringent than the California standard provided that the entire volume of engines including Otto-cycle heavy-duty engines produced by the manufacturer meet the optional standard. To the extent manufacturers participate, this optional program could provide significant air quality benefits to California compared to the more stringent California exhaust emission standards since federal certified trucks that travel to California would be lower emitting than they would be absent this option. 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 by spreading it to a larger number of engines sold nationwide.

The current emission standards are described in Chapter I, Section B.1 of this Staff Report; the need for emission standard amendments is described in Chapter II, Sections C.1. and C.2.; and the description of proposed amendments and their feasibility is included in Chapter III, Sections A.1 and A.2.

Paragraph 6 - Heavy-Duty Diesel Engine Idling Requirements

Purpose
Paragraph 6 describes the heavy-duty diesel engine idling requirements. The introductory paragraph is added to set forth that the existing requirements apply to 2008 through 2023 model year diesel engines used in heavy-duty vehicles over 14,000 pounds and to establish new proposed idling requirements for 2024 and subsequent model diesel engines used in medium-duty vehicles from 10,001 to 14,000 pounds GVWR and heavy-duty vehicles over 14,000 pounds GVWR except as specified in subsection I.11.B.5.2. The paragraph further provides information on the available options for compliance with existing and proposed requirements.

Rationale
The proposed modifications to paragraph 6 are necessary in order to continue to certify 2008 through 2023 model year heavy-duty diesel engines to existing requirements and establish new requirements to new 2024 and subsequent model year medium-duty and heavy-duty diesel engines. The changes are necessary to inform manufacturers of the model year and engine service class applicability of the existing and proposed requirements.

As discussed further in Chapter IIII, Section A.1 of the Staff Report, there are significant emissions benefits to be gained by reducing further idling emissions from heavy-duty diesel vehicles. For this reason, CARB staff is proposing to reduce further idling emissions standards for 2024 and subsequent model year heavy-duty engines used in vehicles greater than 14,000 pounds GVWR and also include medium-duty diesel engines used in vehicles 10,001 to 14,000 to be compliant with the proposed idling emissions requirements. This modification provides an introductory statement clarifying the model year and vehicle class applicability of the existing and proposed idling emissions standards. These standards, in combination with the certification procedures, are necessary to establish a process to certify these engines.

The current idling emission standards are described in Chapter I, Section B.1.4. of this Staff Report; the need for amendments to the idling emission standards is described in Chapter II, Section C.1.2.; and the description of proposed idling emission standard amendments and their feasibility is included in Chapter III, Section A.1.

Subparagraph 6.2

Purpose

Subparagraph 6.2 identifies vehicle applications that are exempt from the idling emission control requirements for new 2008 and subsequent model year heavy-duty diesel engines and vehicles. The proposed modification sets forth the existing exemption for 2008 through 2023 model year heavy-duty engines and vehicles in subsection 6.2.1 and establishes the proposed exemptions for 2024 and later model year heavy-duty engines and vehicles in subsection 6.2.2.

Rationale
As discussed further in Chapter III, Section A.1 of this Staff Report, CARB has idling restrictions in place that require the vehicle driver to shut off the engine after 5 minutes of continuous idling. Other restrictions include a new "clean idle" engine certification requirement that requires new 2008 and later model heavy-duty diesel engines to be equipped with a 5-minute non-programmable automatic engine shutdown system (AESS) or optionally certify to a NOx idling standard of 30 grams per hour.

CARB's idling regulations currently exempt some vehicle applications from the clean idle standards. Exempted vehicle applications include transit buses, tour buses, and any other buses designed to carry more than 15 passengers including the drivers, school buses, recreational vehicles, medium-duty vehicles, armored vehicles, workover rigs, emergency vehicles, and military tactical vehicles. Vehicle Code section 27156.2 and title 13, CCR, section 1905 currently exempt emergency vehicles and military tactical vehicles, respectively, and as a result will continue to be exempted from the proposed requirements. Buses were exempted because of the need for climate control of the large volume of the passenger compartment (the use of an auxiliary power unit (APU) was considered but deemed not practical or effective enough to meet the desired hoteling loads). The other vehicle applications were exempted because CARB determined that those vehicles could not meet the requirements through the use of a non-programmable automatic engine shut down system (AESS) as was originally expected at the time of the rulemaking in 2005. However, in practice, manufacturers have instead met the idling regulations by certifying to clean idle standards of less than 30 grams per hour NOx by using exhaust gas recirculation (EGR) and air-fuel ratio controls. EGR and air-fuel ratio controls are feasible for buses, recreational vehicles, medium-duty vehicles, armored vehicles, and workover rigs, just like for any heavy-duty vehicle, and so the rationale for exempting these vehicles that existed in 2005 no longer exists. As shown in Figure II-4 of this Staff Report, based on recent testing of vehicles via CARB's Truck and Bus Surveillance Program, CARB staff believes that removing the idling regulation exemption for these vehicles would result in meaningful emission reductions. Thus, CARB staff is proposing to remove the existing exemptions for all current exempted vehicle applications except for authorized emergency and military tactical vehicles.

The current idling emission standards are described in Chapter I, Section B.1.4. of this Staff Report; the need for amendments to the idling emission standards is described in Chapter II, Section C.1.2.; and the description of proposed idling emission standard amendments and their feasibility is included in Chapter III, Section A.1.

Subparagraphs 6.3

Purpose
The purpose of the amendment to subparagraph 6.3 is to restructure the existing standards applicable to 2008 through 2023 model years, the proposed standards applicable to 2024 and subsequent model years, and the compliance provisions by subdividing them into compartmentalized subparagraphs that facilitate readability. Subparagraph 6.3 was originally one long paragraph, lumping together the NOx idling standard and the compliance and labeling provisions. Subparagraph 6.3 is now split into 2 subsections, one describing the existing and proposed standards (6.3.1) and a second one describing the compliance and labeling provisions (6.3.2).

Rationale
This amendment is necessary to provide clarity to the regulated community and facilitate compliance and implementation of the idling requirements.

The current idling emission standards are described in Chapter I, Section B.1.4. of this Staff Report; the need for amendments to the idling emission standards is described in Chapter II, Section C.1.2.; and the description of proposed idling emission standard amendments and their feasibility is included in Chapter III, Section A.1.

Subparagraphs 6.3.1, 6.3.1.1, and 6.3.1.2

Purpose
The purpose of the amendment to subparagraph 6.3.1 is to sunset the existing optional NOx idling standard of 30 grams per hour for heavy-duty diesel engines after the 2023 model year in favor of a more stringent 10 grams per hour optional NOx standard for 2024 through 2026 model year engines, and an even more stringent optional NOx standard for 2027 and subsequent model year engines as described in the proposed subparagraph 6.3.1.2. Note that the idling standards are optional in the sense that manufacturers may alternatively comply with engine shutdown system requirements. Currently, all manufacturers meet the current optional NOx idling emission standard rather than complying with the engine shutdown system requirements.

Rationale
This amendment is necessary to increase the stringency of NOx control for manufacturers opting to comply with heavy-duty diesel engine idling requirements using optional NOx idling emission standards. More stringent standards reduce emissions to better protect public health and welfare.

As discussed further in Chapter III, section A.1 of this Staff Report, the proposed requirements to lower the NOx idling emission standards are necessary for California to meet its air quality goals. There are significant emissions benefits to be gained by reducing further idling emissions from diesel engines. Technologies and strategies currently exist than can further reduce idling emissions in a cost-effective manner. Manufacturers are meeting the current idling standards using EGR and air fuel ratio

controls. The same strategy could further be enhanced to provide further reductions in idling emissions. The SwRI Stage 2 program demonstrated that idling emissions could be reduced to very low levels of approximately 3 grams per hour using engine calibration methods such as higher EGR rates, intake throttling, reduced exhaust flow rate, and late combustion phasing. Also, engine technologies such as cylinder deactivation could be used to raise the exhaust temperatures to levels that enable SCR aftertreatment to become active to reduce emissions. As shown in Figure III-2 of this Staff Report, NOx idling emission certification levels for some engines are significantly lower than the proposed standards showing the feasibility of the proposed idling standards.

The current idling emission standards are described in Chapter I, Section B.1.4. of this Staff Report; the need for amendments to the idling emission standards is described in Chapter II, Section C.1.2.; and the description of proposed idling emission standard amendments and their feasibility is included in Chapter III, Section A.1.

Subparagraphs 6.3.2, 6.3.2.1, 6.3.2.2, and 6.3.2.3

Purpose
The purpose of the amendment to subparagraph 6.3.2 is to provide a title “Compliance Determination” and to restructure the existing compliance provisions by subdividing them into compartmentalized subparagraphs that facilitate readability. It also corrects the grammar by changing “this” to “these” and “standard” to “standards” since, with the proposed standards, there would be multiple standards applicable to different model year groups.

Rationale
The addition of a title in this subparagraph is necessary to provide information on the following subparagraphs that follow, it directs the regulated entities on where to find the regulatory language describing methods to determine compliance.

Compliance with the idling NOx emissions standards must be demonstrated according to specified standardized test procedures. Subparagraph 6.3.2.1 is existing language that sets forth the procedures to be followed to meet the existing NOx idling standard for model years 2008 through 2023. It also establishes the same test procedures to be used to show compliance with the proposed NOx idling emissions standard for model years 2024 and subsequent. Compliance with both the existing and the proposed optional NOx idling standards are to be demonstrated according to the existing idle test cycle and test procedures specified in section 86.1360-2007.B.4 of this test procedure. Furthermore, the existing and proposed regulations also provide manufacturers the flexibility to use an alternative test procedure, subject to approval by CARB, if the technology used cannot be demonstrated using the procedures in section 86.1360-2007.B.4.

Subparagraph 6.3.2.2 describes compliance determination for emissions of CO, PM, and NMHC associated with meeting the existing NOx idling emission standard

applicable to 2008 through 2023 model years. Specifically, staff is proposing to use the same procedure to demonstrate compliance with CO, PM, and NMHC associated with meeting the proposed NOx idling emission standard for model year 2024 and subsequent. This amendment is necessary to prevent manufacturers from using strategies that increase CO, PM, and NMHC emissions in order to meet the existing and proposed NOx idling standards. This requirement is also necessary in order to achieve the full benefits of the NOx idling emission standards, which otherwise would be offset if emissions of other pollutants are increased at the expense of reducing NOx emissions. Furthermore, the existing and proposed regulations provide the manufacturer the flexibility to use, upon CARB's approval, an alternative method to determine compliance with the CO, and NMHC requirements.

Subparagraph 6.3.2.3 is an existing requirement that requires certifying manufacturers to produce a vehicle label as defined in subsection I.35.B.4 of the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles," The label is necessary for enforcement purposes to identify and separate idling vehicles that meet the NOx idling standard from those that do not.

The current idling emission standards are described in Chapter I, Section B.1.4. of this Staff Report; the need for amendments to the idling emission standards is described in Chapter II, Section C.1.2.; and the description of proposed idling emission standard amendments and their feasibility is included in Chapter III, Section A.1.

Paragraph 7 - Optional Low NOx Emission Standards for Heavy Duty Engines for 2015 and Subsequent Model Year.

Subparagraphs 7, 7.1 and 7.2

Purpose
The proposed changes split paragraph 7 into two subparagraphs: subparagraphs 7.1 and 7.2. Subparagraph 7.1 provides manufacturers the option to certify their heavy-duty engines to the existing optional low NOx emission standards for 2015 through 2023 model years in lieu of the primary NOx emissions standard of 0.20 g/bhp-hr. Subparagraph 7.2 would provide manufacturers the option to certify 2024 and subsequent model year heavy-duty engines to the proposed optional low NOx standards in lieu of the proposed primary standards for the corresponding model years.

Rationale
These modifications are necessary in order to continue to certify with optional low NOx emission standards that are much lower than the mandatory standards. There is a need to lower the optional NOx emission standards because the proposed mandatory standards for 2027 and subsequent model years would be as stringent as the lowest optional low NOx emission standard in place today (0.02 g/bhp-hr). In 2013, CARB developed optional low NOx standards that are 50 to 90 percent more stringent than those required to pave the way for future standards by providing manufacturers a

mechanism to certify engines to significantly lower emission standards than is required. In addition, incentive programs were also provided to further encourage the purchase of certified optional low NOx engines. Since 2016, manufacturers have been certifying natural gas and propane-fueled low NOx engines that are 50-90 percent lower than current 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. The proposed optional low NOx standards apply only to heavy-duty engines used in vehicles greater than 14,000 pounds GVWR.

The current optional low NOx emission standards are described in Chapter I, Section B.1.3. of this Staff Report; the need for amendments to the optional low NOx emission standards is described in Chapter II, Section C.1.3.; and the description of proposed optional low NOx emission standard amendments and their feasibility is included in Chapter III, Section A.1.

Paragraph 8 - Low Load Cycle Standard for Heavy Duty Engines for 2024 and Subsequent Model Years

Purpose
Paragraph 8 specifies the new low load cycle (LLC) emissions standards and test procedures for 2024 and subsequent model year heavy-duty engines.
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Rationale
As discussed in Chapter II, section C.1.1 and Chapter III, section A.1.1.1, paragraph 8 is necessary to establish LLC compliance requirements for 2024 and subsequent model year medium- and heavy-duty diesel engines. A substantial portion of heavy-duty engine activity in real-world operations are characterized by low load operations, a portion of a vehicle's operating activity that is not adequately tested on either the current FTP or RMC test cycles. Currently, heavy-duty engines operating at lower average engine power for long durations tested on the proposed LLC result in the release of large amounts of NOx emissions as the aftertreatment hardware does not typically reach an adequate thermal temperature to ensure the catalytic conversion of NOx emissions. The addition of the proposed LLC, as a required certification test would help ensure aftertreatment hardware and controls are tuned so that the aftertreatment hardware has adequate thermal heat to allow for the catalytic conversion of NOx emissions during these low load operations. Without such a standard, engines would continue to release excess NOx emissions during low load operation.

The current emission standards are described in Chapter I, Section B.1 of this Staff Report; the need for emission standard amendments is described in Chapter II, Sections C.1. and C.2.; and the description of proposed amendments and their feasibility is included in Chapter III, Sections A.1 and A.2.

Paragraph 9

Purpose
The purpose of this paragraph is to define the exhaust emission standards and model year implementation schedules for 2022 and subsequent model year diesel 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 diesel 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 diesel engines installed in vehicles, depending on the vehicle's GVWR, the proposed amendment specifically identifies the applicable diesel heavy-duty engine exhaust emission standards used in vehicles over 14,000 pounds GVWR that manufacturers of diesel hybrid powertrains would use for their hybrid powertrain systems. These proposed requirements align with those for diesel heavy-duty engines. For example, a diesel hybrid powertrain used in a vehicle with GVWR over 33,000 pounds would need to meet the emission standards and model year implementation schedules for a heavy heavy-duty diesel engine, even if the engine in the optionally certified diesel hybrid powertrain is smaller than a typical heavy heavy-duty diesel engine. 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.

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

A. Federal Provisions. [No change].

B. California 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 diesel hybrid powertrains optionally certified to criteria pollutants emission standards pursuant to title 13 CCR section 1956.8 and to specify that such diesel hybrid powertrains would need to comply with all applicable emission standards for on-road heavy-duty diesel engines for any given model year.

Rationale
This amendment is necessary to allow 2022 and subsequent model year diesel 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 diesel hybrid powertrains. Without this amendment, diesel hybrid powertrains would not be able to be optionally certified to criteria pollutants emissions standards. The amendment's language requiring optionally certified diesel 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 plus NMHC and particulate averaging, trading, and banking for heavy-duty engines. [§86.xxx-15].

A. Federal provisions.

Paragraph 1. §86.004-15

Purpose
Paragraph 1 describes the NOx plus NMHC and particulate averaging, trading, and banking program for heavy-duty engines. The proposed modification updates the latest amended date by U.S. EPA.

Rationale
The proposed modification is necessary to update the date of the last amendments to harmonize with the latest federal regulations.

B. California provisions.

Paragraph 3.

Purpose
Paragraph 3 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, CARB staff is proposing 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 CARB staff is proposing to introduce more stringent NOx and PM emissions standards in the 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 changes to the ABT program is described in Chapter II, Section C.7.; and the description of proposed amendments and their feasibility is included in Chapter III, Section A.7.

Subparagraph (a)

Purpose
The purpose of subparagraphs (a)(1) to (a)(4) is to define the different averaging sets within the proposed CA-ABT program. There would be a total of four averaging sets in the proposed CA-ABT program. These include light heavy-duty diesel, medium heavy-duty diesel, heavy heavy-duty diesel, and 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 by attaining emissions compliance on a corporate-wide basis, the intent of the averaging sets is to ensure that compliance is achieved within each primary intended service class. Therefore, each manufacturer must ensure corporate-wide compliance with the applicable standards within each averaging set.

Historically, the federal-ABT program for diesel engines were comprised of three averaging sets: light heavy-duty, medium heavy-duty and heavy heavy-duty diesel averaging sets. 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 PM emissions is currently available commercially with a diesel particulate filter (DPF) and staff does not believe further incentives in that area is 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 will incentivize the introduction of hybrid powertrains that are compliant with the 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.

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 and their feasibility is included in Chapter III, Section A.7.

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 will 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 can be transferred into any other averaging set such as the light heavy-duty diesel, medium heavy-duty diesel, heavy heavy-duty diesel or 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 ensure 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 NOx 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 trade the NOx 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 NOx 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.

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 and their feasibility is included in Chapter III, Section A.7.

Subparagraph (c)

Purpose
The purpose of subparagraph (c) is to provide guidance on the applicable averaging set for engines used in urban buses. The averaging set would be determined based on the primary intended service class of the engine used in the urban bus.

Rationale
This new subparagraph is necessary to identify what averaging set would be used for diesel engines installed in urban buses. Urban bus emission standards are identical to the heavy-duty diesel engine emissions standards as described in Chapter III, Section A.1 of this Staff Report.

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 and their feasibility is included in Chapter III, Section A.7.

Subparagraph (d)

Purpose
The purpose of subparagraph (d) 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 three-year credit life requirement before 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.

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 and their feasibility is included in Chapter III, Section A.7.

Subparagraph (e)

Purpose

The purpose of subparagraph (e) 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 year will be allowed to be transferred into the CA-ABT program in 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.

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 and their feasibility is included in Chapter III, Section A.7.

Subparagraph (f)

Purpose
The purpose of subparagraph (f) is to provide the mathematical equation to calculate the maximum allowance for the transfer of federal-ABT credits to 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 light heavy-duty diesel 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 Megagram (Mg) of NOx credits in the 2010-2021 model year period. Based on the equation provided, the manufacturer could transfer 1 Mg (10% of the 10 Mg) of NOx credits to the CA-ABT

program. Thus, at the beginning of 2022 model year, the manufacturer would have 9 Mg of NOx credits in the federal-ABT program, and 1 Mg of credits in the CA-ABT program.

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 and their feasibility is included in Chapter III, Section A.7.

Subparagraph (g)

Purpose
The purpose of subparagraph (g) 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. Since the proposed amendments would introduce separate family emission limits (FELs) based on the different engine certification cycles, the FTP-FEL was chosen for calculating the emissions credits in the CA-ABT program. This methodology would also be equivalent to the federal-ABT program because the FTP-FEL is the parameter that is used for credit calculations.

The credit calculation mechanism for the proposed CA-ABT would have some differences versus the federal-ABT calculations. First, the applicable emissions 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 for all heavy-duty engine service classes 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.

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 and their feasibility is included in Chapter III, Section A.7.

Subparagraph (h)

Purpose

The purpose of subparagraph (h) is to reinstate the shelf life requirement for emission credits generated in the proposed CA-ABT program. A proposed five-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 five model year credit life limit. 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 the 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 the 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 short term 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.

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 and their feasibility is included in Chapter III, Section A.7.

Subparagraph (i)

Purpose
The purpose of subparagraphs (i)(1) to (i)(3) is to define the various applicable FELs. There will be separate FELs for each certification test cycle: FTP, RMC, and LLC for engine families, and Vehicle-FTP, Vehicle-SET, and Vehicle-LLC cycles for optionally certified hybrid powertrain families.

Rationale
The proposed amendments are necessary to establish guidelines on determining FELs for various certification test cycles. The introduction of the proposed LLC certification cycle along with the inclusion of the proposed hybrid powertrains in the CA-ABT program requires special considerations. In the federal-ABT program, manufacturers may participate in the program by choosing an FEL value below or above the applicable emissions standards. The same PM and NOx FEL values apply to both the FTP and RMC certification test cycles and may not exceed maximum values (FEL caps) specified in section I.11 of these test procedures for 2023 and previous model years.

The proposed amendments continue with the practice of setting the same FEL values for the FTP and RMC cycles. However, the LLC FEL values would be different, as the applicable LLC emission standard for NOx is also different. The proposed FEL caps and values would be determined as follows:

1) FTP FELs – The FEL values from the FTP (Vehicle-FTP) cycles apply to heavy-duty engines and diesel hybrid powertrains. Manufacturers participating in the CA-ABT program can choose an FEL value above or below the emission standards. The FTP FEL values are used in the credit calculation equations in section I.15.B.3.g of these test procedures. The following proposed FTP FEL caps would be applicable:

A) For 2023 and previous model years, the existing FTP FEL caps are specified in section I.11 of these test procedures and continue to remain in effect.

B) For 2024 through 2026 model years, the FTP NOx FEL cap would be set to 0.10 g/bhp-hr. This value is chosen to prevent manufacturers from certifying products with high emission levels. The 0.10 value is equivalent to the optional 50-state-directed engine NOx emission standards.

C) For 2027 and subsequent model years, the FTP NOx FEL cap would be set to a lower value based on the results from the SwRI stage 3 demonstration program.

D) For 2024 and subsequent model years, the FTP PM FEL cap would be set at 0.010 g/bhp-hr which is equivalent to the previously established PM emission standard for the 2023 and previous model years.

2) RMC FELs – As mentioned earlier, the RMC FEL values and caps have historically been equivalent to the FTP FEL values and caps. Once a manufacturer chooses an FTP FEL value, the same value applies to the RMC cycle. The same practice would continue to be used in the proposed amendments for 2024 and subsequent model years.

3) LLC FELs – Starting with the 2024 model year, the introduction of the LLC would require a new LLC NOx FEL value for manufacturers participating in the CA-ABT program. In developing the LLC NOx emission standards, the concept of a multiplier was used, that is, the LLC NOx standard was determined by multiplying the FTP NOx standard by a numerical factor. In Chapter III, section A.1.1.1 of this Staff Report, the rationale for using a multiplier for the LLC NOx standard in the 2024 through 2026 model year timeframe is described. In Chapter III, section A.1.1.2 of this Staff Report, the rationale for using a multiplier for 2027 and subsequent model year LLC NOx standards is described. The

proposed amendments use the same reasoning for establishing the multiplier concept for the LLC NOx FEL value.

Therefore, as described in subparagraph (i)(3), the proposed LLC NOx FEL in the 2024-2026 model year timeframe would be determined by multiplying the FTP NOx FEL (which is chosen by the engine manufacturer) by a multiplier. Similarly, the proposed LLC NOx FEL in the 2027 and subsequent model years would be determined by multiplying the manufacturer specified FTP NOx FEL by a smaller multiplier. Emission test results from the SwRI stage 3 demonstration program support the reduction of the value of the multiplier for 2027 and subsequent model years as more sophisticated technologies would be implemented. This methodology ensures that manufacturers participating in the CA-ABT will not produce products that have low emission levels on one test cycle (for example FTP) while having high emission levels on another test cycle (for example LLC).

The proposed cap for the LLC PM FEL for 2024 and subsequent model years would be set at 0.010 g/bhp-hr. The current technology for reducing the PM emissions from heavy-duty diesel engines is comprised of a DPF system which is a very effective system for filtering out and reducing tailpipe PM emissions under all operations and emissions test cycles. As such, staff believes that the LLC PM FEL cap should be similar to the FTP PM FEL cap.

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 and their feasibility is included in Chapter III, Section A.7.

Subparagraph (j)

Purpose
The purpose of subparagraphs (j)(1) to (j)(3) is to establish and define the heavy-duty zero-emission averaging set for NOx 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 NOx credits in the heavy-duty zero-emission averaging set under the CA-ABT program.

Rationale
As discussed further in Chapter III, Section A.7.5 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 heavy-duty zero-emission vehicles (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 (j)(1) reaffirms the applicability of credit life provisions for credits in this averaging set.

Subparagraph (j)(2) provides the mathematical equation for calculating the NOx credits generated by heavy-duty zero-emission vehicles. The amount of credit is dependent on the vehicle class size. The larger vehicle classes have longer useful life periods and 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 (j)(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 ensures 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 (k)

Purpose
The purpose of subparagraphs (k)(1) to (k)(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 (k)(1) to (k)(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.

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 and their feasibility is included in Chapter III, Section A.7.

Paragraph 4

Purpose
New Paragraph 4 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.

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 and their feasibility is included in Chapter III, Section A.7.

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 providing this incentive starting with the 2022 model year when the CA-ABT program is established. The federal-ABT program does not have an equivalent mechanism. The early compliance incentive 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.

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 and their feasibility is included in Chapter III, Section A.7.

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 multiplier.

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 and their feasibility is included in Chapter III, Section A.7.

Subparagraph (c)

Purpose
The purpose of subparagraph (c) is to provide the equation to be used 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. For example, a manufacturer would calculate the credits for each eligible engine family (or hybrid powertrain family) and then multiply the generated credits by the applicable multiplier value.

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. 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, CARB 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.

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.

Subparagraph (e)

Purpose
The purpose of subparagraph (e) to clarify 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 heavy-duty zero-emission vehicles. 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.

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.

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

B. California Provisions.

Paragraph 3

Purpose
Paragraph 3 would establish certification requirements for manufacturer that opt into the optional 50-state-directed engine emissions program. It requires a participating manufacturer to 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 with CARB and 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 emissions standards are described in section 1.1.1.2 of the Staff Report.

23. Required data. [§86.xxx-23]

A. Federal provisions.

Paragraph 1. §86.098-23

Purpose
Paragraph 1 describes the required data that would be submitted by the manufacturers. The proposed modification corrects the last amended date by U.S. EPA to harmonize with the current version of the regulations.

Rationale
The proposed modification is necessary to harmonize with the latest set of federal regulations.

Subparagraph 1.2.1

Purpose
Subparagraph 1.2.1 specifies that if a durability test method is accepted by U.S. EPA, it shall also be accepted by CARB subject to specified conditions. This subparagraph is modified to add the phrase “for 2023 and previous model years.”

Rationale
As discussed further in Chapter II, Section C.8 of this Staff Report, the current durability test methods specified in the regulations are insufficient in simulating real-life aging of the engine and aftertreatment system. The proposed amendments require a more standardized process for demonstrating durability. As such, the current durability test methods will only remain in effect through the 2023 model year.

The current durability program is described in Chapter I, Section B.8 of this Staff Report; and the description of proposed durability program amendments and their feasibility is included in Chapter III, Section A.8.

Subparagraph 1.2.2

Purpose
New Subparagraph 1.2.2 is added to refer to the proposed durability demonstration program for 2024 and subsequent model years.

Rationale
As discussed further in Chapter III, Section A.8 of this Staff Report, the proposed durability demonstration program will be applicable for 2024 and subsequent model years. This subparagraph is necessary to provide the reference for the new guidelines. The need for changes to the durability program is described in Chapter II, Section C.8.; and the description of proposed durability program amendments and their feasibility is included in Chapter III, Section A.8.

Subparagraph 1.4

Purpose
Subparagraph 1.4 identifies CARB's designated person and address to whom the manufacturer has to submit all reports. The proposed modification updates the current Division name and the mailing address.

Rationale
This proposed modification is necessary to provide the correct Division name and mailing address to which the manufacturer submits reports.

24. Test vehicles and engines. [§86.xxx-24]

A. Federal provisions.

Paragraph 2. §86.096-24. April 28, 2014.

Purpose
Paragraph 2 harmonizes California regulations with U.S. EPA regulations in terms of the requirements for test vehicles and engines. This paragraph describes the grouping of test vehicles or engines into families for certification emissions tests. The proposed language was modified to account for the presence of the aftertreatment system.

Rationale
The addition of this paragraph is needed to harmonize the grouping of test vehicles with U.S. EPA. Additionally, special provisions were added to account for the impacts of the aftertreatment system on the grouping of vehicles starting with the 2024 model year. The current on-road heavy-duty diesel engine architecture includes an aftertreatment system to control the tailpipe NOx emissions. As such, the grouping must consider the impacts of the aftertreatment system via the consideration of the aftertreatment conversion efficiency.

25. Maintenance. [§86.xxx-25]

A. Federal Provisions.

Purpose

The purpose of this amendment is to enumerate the changes that must be made to this section in order that the federal minimum maintenance interval provisions for Diesel-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 Diesel Engines and Vehicles" to support the proposed rulemaking. Primarily, the amendment sunsets the exclusivity to diesel-fueled engines of the maintenance intervals in subparagraph (b)(4)(vi) and also the exemption for diesel engines used exclusively in hybrid vehicles. Subparagraphs 1.1 through 1.15 of this section explain these changes in detail.

The proposed amendment also include optionally certified diesel hybrid powertrains into the maintenance requirements.

Rationale
The proposed amendments to this section are specific to heavy-duty diesel engine minimum maintenance intervals. Heavy-duty Otto-cycle engine minimum maintenance intervals are specified in the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles."

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.

This amendment also add the maintenance requirements for 2022 and subsequent model year diesel hybrid powertrains optionally certified pursuant to title 13, CCR §1956.8 for heavy-duty vehicles. In addition, this amendment would clarify the requirements for specified emission-related components for heavy-duty diesel hybrid powertrain systems. These requirements align with those for heavy-duty diesel 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

The particular necessities of these amendments are described below.

Subparagraph 1.1

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

Rationale

This amendment is necessary to set the applicable minimum maintenance intervals, including adjustment or cleaning and repair or replacement intervals, for specified emission-related components for 2022 and subsequent model year diesel hybrid powertrains optionally certified pursuant to title 13, CCR §1956.8. This amendment would clarify the requirements for specified emission-related components for heavy-duty diesel hybrid powertrain systems. These requirements align with those for heavy-duty diesel 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)(v)(H) for which no change is required. Previously this range extended from paragraph (a) in its entirety, but CARB staff is proposing to amend subparagraph (a)(1) to include applicability for hybrid powertrains as part of these amendments.

Subparagraph 1.3 was renumbered for sequence (previously 1.2).

Subparagraph 1.4 was renumbered for sequence (previously 1.3).

Purpose
The purpose of this subparagraph is to specify diesel engine maintenance intervals and to include optionally certified diesel hybrid powertrains into the minimum maintenance interval requirements of this subparagraph for specified emission-related components , such as fuel injectors, of this section. The proposed amendment includes optionally certified diesel hybrid powertrains into these requirements.

Rationale
Subparagraph (b)(4)(i) is specific to the minimum maintenance intervals for exhaust gas recirculation system related filters and coolers, crankcase ventilation valves and filters, fuel injector tips, and diesel exhaust fluid filters. The proposed amendment to this subparagraph (b)(4)(i) sunsets the exemption from more stringent minimum maintenance intervals with the 2026 model year for engines used in hybrid vehicles exclusively (i.e., the engine family is not also certified for use in conventional internal combustion vehicles), and for engines certified on alternative fuels, or on both diesel and alternative fuels. The qualifying phrase "… used in vehicles with a GVWR greater than 14,000 pounds" was added to clarify that the sunsetting of the exemptions applies only to engines used in heavy-duty vehicles greater than 14,000 GVWR because the lower range for heavy-duty vehicles is 8,500 GVWR. Engines used in heavy-duty vehicles less than or equal to 14,000 GVWR remain subject to existing maintenance intervals.

The amendment further modifies subparagraph (b)(4)(i) to sunset the exclusivity to diesel-fueled engines of the more stringent minimum maintenance intervals in

subparagraph (b)(4)(vi) to diesel-fueled engines only. Currently, only heavy-duty engine families certified for use on only diesel fuel are required to meet the more stringent minimum maintenance intervals in subparagraph (b)(4)(vi) as discussed in Chapter III Section 4.3 of the Staff Report. As proposed, this exclusive applicability would continue through the 2026 model-year for heavy-duty diesel engines certified for use on only diesel fuel in favor of a more comprehensive approach beginning with 2027 models that extends applicability of the minimum maintenance intervals in subparagraph (b)(4)(vi) to any heavy-duty engine certified to the Diesel-cycle standards in 13 CCR 1956.8, including alternative-fueled engines and engines certified for use in hybrid vehicles exclusively or in both hybrid vehicles and conventional internal combustion vehicles. Several grammatical changes were made to this subparagraph to improve readability and consistency of terminology throughout the provision. A typographical error was corrected such that the erroneous word “are” was replaced with the correct word “and.” Neither the grammatical nor typographical revisions to subparagraph (b)(4)(i) affect the applicability of the provision.

This amendment is also needed to set the applicable minimum maintenance intervals, including adjustment or cleaning and repair or replacement intervals, for specified emission-related components for 2022 and subsequent model year diesel hybrid powertrains optionally certified pursuant to title 13, CCR §1956.8. This amendment would clarify the requirements for specified emission-related components for heavy-duty diesel hybrid powertrain systems. These requirements align with those for heavy-duty diesel 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 was renumbered for sequence (previously 1.4).

Subparagraph 1.6 was renumbered for sequence (previously 1.5).

Purpose
The purpose of this subparagraph is to specify lengthened minimum repair and replacement maintenance interval requirements for specified emission-related components of this subparagraph for diesel engines and optionally certified diesel hybrid powertrains.

Rationale
Subparagraph (b)(4)(iii) is specific to the minimum maintenance intervals for fuel injectors, turbochargers, electronic engine control units, diesel particulate filters, exhaust gas recirculation systems, catalytic converters, and add-on emission-related components. The proposed amendment to this subparagraph (b)(4)(iii) sunsets the exemption from more stringent minimum maintenance intervals with the 2026 model year for engines used in hybrid vehicles exclusively (i.e., the engine family is not also certified for use in conventional internal combustion vehicles), and for engines certified

on alternative fuels, or on both diesel and alternative fuels. The qualifying phrase "… used in vehicles with a GVWR greater than 14,000 pounds" was added to clarify that the sunsetting of the exemptions applies only to engines used in heavy-duty vehicles greater than 14,000 GVWR because the lower range for heavy-duty vehicles is 8,500 GVWR. Engines used in heavy-duty vehicles less than or equal to 14,000 GVWR remain subject to existing maintenance intervals (see Chapter III Section 4.3 of the Staff Report).

The amendment further modifies subparagraph (b)(4)(iii) to sunset the exclusivity to diesel-fueled engines of the maintenance intervals in subparagraph (b)(4)(vi). Currently, only heavy-duty engine families certified for use on only diesel fuel are required to meet the more stringent minimum maintenance intervals in subparagraph (b)(4)(vi). As proposed, this exclusive applicability would continue through the 2026 model-year for heavy-duty diesel engines certified for use on only diesel fuel in favor of a more comprehensive approach beginning with 2027 models that extends applicability of the minimum maintenance intervals in subparagraph (b)(4)(vi) to any heavy-duty engine certified to the Diesel-cycle standards in 13 CCR 1956.8, including alternative-fueled engines and engines certified for use in hybrid vehicles exclusively or in both hybrid vehicles and conventional internal combustion vehicles. Several grammatical changes were made to this subparagraph to improve readability and consistency of terminology throughout the provision. The grammatical revisions to subparagraph (b)(4)(iii) do not affect the applicability of the provision.

This amendment is also necessary to set the applicable minimum maintenance intervals and repair or replacement intervals for specified emission-related components for 2022 and subsequent model year diesel hybrid powertrains optionally certified pursuant to title 13, CCR §1956.8. This amendment would clarify the requirements for specified emission-related components for heavy-duty diesel hybrid powertrain systems. These requirements align with those proposed for heavy-duty diesel 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 was renumbered for sequence (previously 1.6).

Subparagraph 1.8 was renumbered for sequence (previously 1.7).

Purpose
The purpose of this subparagraph is to specify the lengthened minimum repair and replacement maintenance interval requirements for specified emission-related components for heavy-duty diesel engines. The proposed amendment include the maintenance intervals for optionally certified diesel hybrid powertrains.

Rationale

This amendment to subparagraph (b)(4)(vi) is parallel to the proposed amendment in subparagraphs (b)(4)(i) and (b)(4)(iii) (see Subparagraphs 1.4 and 1.6 above), and as such, modifies subparagraph (b)(4)(vi) to sunset the exclusivity to diesel-fueled engines of the more stringent minimum maintenance intervals to diesel-fueled engines only. Currently, only heavy-duty engine families certified for use on only diesel fuel are required to meet the more stringent minimum maintenance intervals in subparagraph (b)(4)(vi) as discussed in Chapter III Section 4.3 of the Staff Report. As proposed, this exclusive applicability would continue through the 2026 model-year for heavy-duty diesel engines certified for use on only diesel fuel in favor of a more comprehensive approach beginning with 2027 models that extends applicability of the minimum maintenance intervals to any heavy-duty engine certified to the Diesel-cycle standards in 13 CCR 1956.8, including alternative-fueled engines and engines certified for use in hybrid vehicles exclusively or in both hybrid vehicles and conventional internal combustion vehicles. A grammatical change was made to this subparagraph to improve readability and consistency of terminology throughout the provision. The grammatical revision to subparagraph (b)(4)(vi) does not affect the applicability of the provision. The amendment also fixes an error in which the instructions to limit maintenance intervals to the values in the table incorrectly references only mileage intervals. Several of the maintenance intervals in the table also specify hours and/or years in addition to miles. The intention was always to allow the first occurring of any stated minimum maintenance interval in the table to dictate the frequency by which the manufacturer is allowed to schedule maintenance for that part. This amendment does not affect applicability because the requirement to use the minimum maintenance intervals in this subparagraph (b)(4)(vi) does not begin until model year 2022.

This amendment is also needed to set the applicable minimum maintenance intervals and repair or replacement intervals for specified emission-related components for 2022 and subsequent model year diesel hybrid powertrains optionally certified pursuant to title 13, CCR §1956.8. This amendment would clarify the requirements for specified emission-related components for heavy-duty diesel hybrid powertrain systems. These requirements align with those proposed for heavy-duty diesel 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 1.9

Purpose
The purpose of this subparagraph is to include optionally certified diesel hybrid powertrains into the minimum maintenance interval requirements for specified emission-related components of this section.

Rationale
This amendment is necessary to specify the applicable minimum maintenance requirements for 2022 and subsequent model year diesel hybrid powertrains optionally

certified pursuant to title 13, CCR §1956.8. Maintenance requirements are critical in ensuring hybrid powertrains will be manufactured that meet the minimum performance requirements for specified emission-related components and will help inform and protect purchasers of hybrid powertrains. Due to differences in the minimum maintenance requirements for heavy-duty diesel engines used in vehicles with a GVWR greater than 14,000 pounds, depending on the vehicle's GVWR, manufacturers of hybrid powertrains need to be able to ascertain which maintenance requirement for heavy-duty diesel-cycle engines would apply to their hybrid powertrain system. These requirements align with those for heavy-duty diesel engines. So, for example, an optionally certified diesel engine hybrid powertrain in a vehicle with a GVWR greater than 33,000 pounds would need to meet the maintenance interval requirements for heavy heavy-duty diesel engines, even if the engine in the optionally certified diesel engine hybrid powertrain is smaller than a typical heavy heavy-duty diesel engine. 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 1.10 was renumbered for sequence (previously 1.8).

Subparagraph 1.11 was renumbered for sequence (previously 1.9).

Subparagraph 1.12 was renumbered for sequence (previously 1.10).

Subparagraph 1.13 was renumbered for sequence (previously 1.11).

Subparagraph 1.14 was renumbered for sequence (previously 1.12).

Subparagraph 1.15 was renumbered for sequence (previously 1.13).

26. Mileage and service accumulation; emission measurements. [§86.004-26]. April 28, 2014.

A. Federal Provisions. [No change]

B. California provisions.

Paragraph 1.

Purpose
Paragraph 1 introduces the proposed durability demonstration program provisions for 2024 and subsequent model year medium-duty and heavy-duty diesel engine families. The proposed provisions also apply to heavy-duty diesel hybrid powertrains.

Rationale

Starting with 2024 model year, manufacturers of on-road heavy-duty diesel engines will be required to implement the newly developed durability demonstration program (DDP) to show compliance with the new emissions standards. As described in Chapter II, Section C.8 of this Staff Report, the existing provisions do not provide results that are equivalent to what is observed during in-use operations. As such, staff has developed a standardized durability demonstration process for 2024 and subsequent model years. For diesel hybrid powertrains, a similar demonstration process is proposed using the standardized Vehicle-FTP, Vehicle-RMC and Vehicle-LLC cycles.

The current durability program is described in Chapter I, Section B.8 of this Staff Report; the need for changes to the durability program is described in Chapter II, Section C.8.; and the description of proposed durability program amendments and their feasibility is included in Chapter III, Section A.8.

Subparagraph 1.1

Purpose
New subparagraph 1.1 would require full useful life aging of the engine and aftertreatment system (or diesel hybrid powertrain system) to demonstrate compliance with the applicable emissions standards for 2024 and subsequent model year certification applications.

Rationale
The new subparagraph is necessary to specify the applicable service accumulation schedules for full useful life aging which would be required to demonstrate component durability and to calculate the deterioration factors for 2024 and subsequent model years. The new process is described in detail in Chapter III, Section A.8 of this Staff Report.

The current durability program is described in Chapter I, Section B.8 of this Staff Report; the need for changes to the durability program is described in Chapter II, Section C.8.; and the description of proposed durability program amendments and their feasibility is included in Chapter III, Section A.8.

Subparagraph 1.1.1

Purpose
New subparagraph 1.1.1 describes the proposed DDP requirements for the 2024 through 2026 model year period. The proposed program requires specific number of hours for aging which is a function of the engine family service class, specific aging cycles, introduces the accelerated aftertreatment aging process, and introduces the requirement to submit in-use NOx emission reports if accelerated aftertreatment aging is used.

Rationale

The key objectives of the proposed new DDP are to standardize the aging process and to mandate full useful life aging in 2024 and subsequent model years. The background on the existing DDP process was described in Chapter I, Section B.8 of this Staff Report. The need for a new standardize DDP process was described in Chapter II, Section C.8 of this Staff Report. The new proposed DDP is described in detail in Chapter III, Section A.8 of this Staff Report.

Subparagraph 1.1.1.1 through 1.1.1.4 2.1 detail the required service accumulation schedule for medium-duty, light heavy-duty, medium heavy-duty, and heavy heavy-duty diesel engines. All service classes will be required to accumulate a certain number of aging hours on an engine dynamometer proportional to the applicable useful life of the engine. For heavy heavy-duty engines, an option to use accelerated aftertreatment aging for a portion of useful life is provided in subparagraph 1.1.1.4.2.1. This option is further detailed in Chapter III, Section A.8.5 of this Staff Report.

Subparagraph 1.1.1.4.2.2 mandates the submittal of in-use NOx emission reports for manufacturers that use the accelerated aftertreatment option. This is further described in Chapter III, Section A.8.6 of this Staff Report.

Subparagraphs 1.1.1.4.2.3 and 1.1.1.4.2.4 describe the requirements for accelerated aftertreatment aging program, which is further detailed in Chapter III, Section A.8.5 of this Staff Report.

Subparagraphs 1.1.1.5 through 1.1.1.6 describe the aging cycle selection process for the DDP. Manufacturers will be required to examine the relationship between the engine family and the vehicle platforms where the engine family will be used. The appropriate aging cycle will be chosen so that it will lead to the highest possible load factor. Additional details regarding the cycle selection process are provided in Chapter III, Sections A.8.2 and A.8.3 of this Staff Report.

Subparagraph 1.1.1.7 allows the manufacturers to use the forced cooldown provisions which are currently applicable for emissions testing and are specified in section 1065.530.a.1 of these test procedures.

Subparagraph 1.1.2

Purpose
Subparagraph 1.1.2 introduces the DDP process for 2027 and subsequent model years. As described in Chapter III, Section A.5.1.1 of this Staff Report, useful life periods for heavy-duty diesel engines are increased first in the 2027 model year and subsequently in the 2031 model years. Extension of the useful life period would require a longer DDP to demonstrate compliance with the emissions standards. Therefore, the DDP for 2027 and subsequent model years would continue to use the same elements while requiring longer aging periods. It should also be noted that the useful life for medium-duty engines does not change in the referenced period.

Rationale
Subparagraph 1.1.2 introduces the DDP for the 2027 and subsequent model year period. In this period, all heavy-duty engine manufacturers will be eligible for accelerated aftertreatment aging and therefore will be subject to in-use NOx emission reporting.

Subparagraphs 1.1.2.1 through 1.1.2.1.4 describe the required service accumulation schedules (aging hours) for the 2027 through 2030 model years. As described in Chapter III, Section A.8.8 of this Staff Report, the elements of the program are identical to the proposal for the 2024 through 2026 model year program. However, the required hours of aging are longer because the useful life periods are longer. Another feature of the program is the availability of in-use NOx emission reporting for all service classes.

Subparagraph 1.1.2.1.5 describes the relief mechanism in terms of reduced aging hours for manufacturers that submit in-use NOx emission reports for more than 50 percent of the engines that have been originally sold in California for three consecutive model years. The intent is to encourage manufacturers to submit in-use NOx emission reports from as many engines as possible to verify the results from laboratory aging. Manufacturers that submit in-use NOx emission reports from more than 50 percent of their California sales volume for three consecutive model years will be able to conduct accelerated aftertreatment aging for a larger portion of the applicable useful life. Subparagraphs 1.1.2.1.5.1 through 1.1.2.1.5.3 provide the service accumulation schedules for these manufacturers. This is further described in Chapter III, Section A.8.8 of this Staff Report.

Subparagraph 1.1.2.2. describes the required durability program for 2031 and subsequent model years. This is described in detail in Chapter III, Section A.8.9 of this Staff Report.

Subparagraphs 1.1.2.2.1 through 1.1.2.2.4 describe the required heavy-duty diesel engine service accumulation schedules for 2031 and subsequent model years. Similar to previous model years, the program combines some amount of engine and aftertreatment aging on a dynamometer followed by accelerated aftertreatment aging and requires the submittal of in-use NOx emission reports for manufacturers that use accelerated aftertreatment aging.

Subparagraph 1.1.2.2.5 describes the relief mechanism for manufacturers that submit in-use NOx emission reports for five consecutive model years covering more than 50 percent of their California Sales. The five consecutive model year requirement is due to the fact that the warranty period and useful life for heavy-duty engines increase in the 2027 model year. Staff believes that the lengthened warranty and useful life periods will cause the owners of the heavy-duty vehicle to keep the telematics capability active for a longer period; thereby, making the submittal of in-use NOx emission reports possible for a five-year period. The reduction in the service accumulation hours is derived by increasing the allowable accelerated aging period. Subparagraphs 1.1.2.2.5.1 through

1.1.2.2.5.3 specify the length of the service accumulation schedules for the 2031 and subsequent model years.

The current durability program is described in Chapter I, Section B.8 of this Staff Report; and the need for changes to the durability program is described in Chapter II, Section C.8.

Subparagraph 1.1.3

Purpose
New subparagraph 1.1.3 specifies the proposed reporting requirements for the in-use NOx emissions reporting program. Manufacturers that participate in the program must submit a separate report for each heavy-duty engine family (with SCR system) that was originally sold in the California market. This in-use NOx emissions reporting is not required for engines that have passed their applicable useful life period.

Rationale
The new subparagraph is necessary to provide instructions on the frequency of reporting and the content of the reports. Additional information regarding this program is provided in Chapter III, Section A.8.6 of this Staff Report.

Subparagraphs 1.1.3.1.1 and 1.1.3.1.2 specify the products that are required to submit in-use NOx emission reports. The reporting is required for manufacturers that opt to use accelerated aftertreatment aging.

Subparagraph 1.1.3.2 requires a report for each applicable engine family.

Subparagraph 1.1.3.3 specifies the designated officer who will be the recipient of the report and the timeline for submitting the initial report.

Subparagraph 1.1.3.4 specifies the timeline for the submittal of subsequent annual reports.

Subparagraph 1.1.3.5 mandates a six-month interval in between the data recordings from each vehicle/engine. This is to assure that CARB receives in-use NOx emission data covering a large period of time (at least six months).

Subparagraph 1.1.3.6 exempts engines that have passed their applicable useful life from in-use NOx emission reporting.

Subparagraph 1.1.3.7 specifies the required fields in the annual NOx emission reports. In addition to typical vehicle operational parameters such as the odometer reading, and operational hours, staff is asking for submittal of REAL parameters as specified in title 13, CCR, sections 1971.1 (h)(5.2) through (h)(5.6). This is further described in Chapter III, Section A.8.6 of this Staff Report.

Subparagraph 1.1.3.8 specifies the minimum submittal criteria for in-use NOx emission reporting. Manufacturers that are subject to reporting must submit reports for at least 20 percent of their California sales volume for three consecutive model years in the 2024 through 2030 model years, or five consecutive model years in the 2031 and subsequent model years, otherwise, manufacturers would no longer be eligible to use accelerated aftertreatment aging as part of their durability demonstration program. Manufacturers were allowed to use accelerated aftertreatment aging because CARB expects them to verify the validity of the aging process via in-use NOx emission reporting. If a manufacturer fails to submit data for more than 20 percent of their California sales, then they should not be eligible to use accelerated aging either.

Subparagraph 1.1.3.9 specifies that data from vocational and tractor vehicles must be included in the in-use NOx emission reports. This would prevent manufacturers from biasing the reporting requirement towards specific vehicle applications.

The current durability program is described in Chapter I, Section B.8 of this Staff Report; and the need for changes to the durability program is described in Chapter II, Section C.8.

Subparagraph 1.2

Purpose
Subparagraph 1.2 provides guidelines for the break-in period for emission-data and durability-data engines for 2024 and subsequent model year medium-duty and heavy-duty diesel engines equipped with SCR systems.

Rationale
The new subparagraph is necessary to harmonize the break-in approach for 2024 and subsequent model year on-road heavy-duty diesel engines to parallel the Tier IV off-road compression-ignition engines break-in requirement. The proposed amendments increase the default break-in period to 300 hours. This is further described in Chapter III, Section A.8.1 of this Staff Report.

The current durability program is described in Chapter I, Section B.8 of this Staff Report; and the need for changes to the durability program is described in Chapter II, Section C.8.

Subparagraph 1.2.1

Purpose
Subparagraph 1.2.1 provides instructions on how to demonstrate through periodic emissions testing using the FTP, RMC, and LLC cycles, the number of hours at which the engine and aftertreatment system combination is stabilized for emissions testing.

Rationale

In-lieu of using the default 300-hour break-in period, manufacturers are allowed to use a shorter break-in period if they can demonstrate via periodic emissions testing using at least three emissions test points with evenly spaced intervals of 60 hours of service accumulation that tailpipe emissions have been stabilized. This is described in Chapter III, Section A.8.1 of this Staff Report. The current durability program is described in Chapter I, Section B.8 of this Staff Report; and the need for changes to the durability program is described in Chapter II, Section C.8.

Subparagraph 1.3

Purpose
Subparagraph 1.3 describes the methodology for calculating the exhaust emission deterioration factors (DFs) for engines that use the accelerated aftertreatment aging process.

Rationale
The new subparagraph is necessary to provide guidance to manufacturers on how to determine the applicable DFs. The methodology recommends the use of a linear regression calculation so that the results from all emission measurements can be considered when calculating the additive or multiplicative DFs. This is further described in Chapter III, Section A.8.5 of this Staff Report. The current durability program is described in Chapter I, Section B.8 of this Staff Report; and the need for changes to the durability program is described in Chapter II, Section C.8.

Subparagraph 1.4

Purpose
Subparagraph 1.4 specifies the handling of sawtooth and other nonlinear deterioration patterns.

Rationale
The new subparagraph is necessary to establish the provisions for nonlinear deterioration patterns. For 2024 and subsequent model year engine families, the deterioration factor calculations assume that the highest useful life emissions occur either at the end of useful life or at the low-hour test point. If a nonlinear deterioration pattern occurs, the highest emission measurements shall be used to calculate the DFs. This requirement harmonizes the handling of nonlinear deterioration patterns with the applicable GHG regulations as described in section 1036.241.c.3 of these test procedures.

Paragraph 2

Purpose
Paragraph 2 was added to describe the DDP process for heavy-duty diesel hybrid powertrains. The DDP is designed to mirror the DDP program for heavy-duty diesel engines.

Rationale

This amendment is necessary to provide clarity to the applicable mileage and service accumulation of this section for 2022 and subsequent model year heavy-duty diesel hybrid powertrains optionally certified pursuant to title 13, CCR §1956.8. Durability demonstration requirements are critical in ensuring hybrid powertrains will be durable over the applicable useful life for specified emission-related components and will help inform and protect purchasers of hybrid powertrains. Due to differences in the durability demonstration requirements for heavy-duty diesel engines used in vehicles with a GVWR greater than 14,000 pounds, depending on the vehicle's GVWR, manufacturers of heavy-duty diesel hybrid powertrains need to be able to ascertain which durability demonstration period for heavy-duty diesel engines would apply to their diesel hybrid powertrain system. These requirements align with those proposed for heavy-duty diesel engines. So, for example, an optionally certified diesel engine hybrid powertrain in a vehicle with a GVWR greater than 33,000 pounds would need to meet the durability demonstration requirements for heavy heavy-duty diesel engines, even if the engine in the optionally certified diesel engine hybrid powertrain is smaller than a typical heavy heavy-duty diesel engine.

This amendment is also necessary to provide additional clarity on the differences in durability demonstration requirements for hybrid powertrains using certified on-road diesel engines and hybrid powertrains using engines other than certified on-road diesel engines. Since diesel hybrid powertrains optionally certified pursuant to title 13, CCR §1956.8 are not restricted to use only certified on-road heavy-duty diesel engines, a manufacturer could elect to use any other combustion-engine platform. The clarifications afforded by this amendment are the required specificities for the durability demonstration for each choice of diesel engines used in the hybrid powertrain. Hybrid powertrains using certified heavy-duty on-road diesel engines will only need to provide durability demonstration for specified hybrid components since the durability demonstration of the diesel engines has been completed. However, in order to utilize this option, a manufacturer must provide documentation, including, but not limited to, test data, engineering analysis, to demonstrate to the satisfaction of the Executive Officer that engine and emission-related durability for the certified on-road heavy-duty diesel engine will be similar or substantially similar when integrated in a hybrid powertrain. Heavy-duty diesel hybrid powertrains using engines other than certified heavy-duty on-road diesel engines, including on- or off-road uncertified diesel engines, must provide complete demonstration for both the engine and the specified hybrid components in accordance with the provisions of this paragraph.

Overall, this amendment will ensure that manufacturer know which durability demonstration requirements will apply to their specific diesel hybrid powertrain system, as well as be protective of the purchasers of vehicles powered with diesel hybrid powertrains by aligning the durability demonstration requirements for diesel hybrid powertrains with those for heavy-duty on-road diesel engines for different vehicle classes.

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 2.1

Purpose
Subparagraph 2.1 describes the required DDP for heavy-duty diesel hybrid powertrains for the 2022 and subsequent model years.

Rationale
The new durability amendments would require aging of the complete heavy-duty diesel hybrid powertrains using the service accumulation schedules that were described in section I.26 of these test procedures.

The current durability program is described in Chapter I, Section B.8 of this Staff Report, while current hybrid powertrain certification procedures are described in Chapter I, Section B.9. The need for changes to the durability program is described in Chapter II, Section C.8., while the need for changes to the hybrid powertrain certification procedures is described in Chapter I, Section C.9. Finally, a description of proposed durability program amendments is included in Chapter III, Section A.8, while a description of proposed hybrid powertrain certification procedure amendments is included in Chapter III, Section A.9.

Subparagraph 2.2

Purpose
The purpose of this subparagraph is to identify the requirements for diesel hybrid powertrains used in class 4 and 5 vehicles.

Rationale
The GVWR for class 4 and 5 vehicles range from 14,001 to 19,500 lbs. Under the definition of primary intended service class (section 1036.140.a.1 of these test procedures), light heavy-duty engines are primarily intended for class 4 and 5 vehicles. As such, the DDP procedures for light heavy-duty diesel engines will be applicable to diesel hybrid powertrains used in class 4 and 5 vehicles.

The current durability program is described in Chapter I, Section B.8 of this Staff Report, while current hybrid powertrain certification procedures are described in Chapter I, Section B.9. The need for changes to the durability program is described in Chapter II, Section C.8., while the need for changes to the hybrid powertrain certification procedures is described in Chapter I, Section C.9. Finally, a description of proposed durability program amendments is included in Chapter III, Section A.8, while a

description of proposed hybrid powertrain certification procedure amendments is included in Chapter III, Section A.9.

Subparagraph 2.3

Purpose
The purpose of this subparagraph is to identify the requirements for diesel hybrid powertrains used in class 6 and 7 vehicles.

Rationale
The GVWR for class 6 and 7 vehicles ranges from 19,501 to 33,000 lbs. Under the definition of primary intended service class (section 1036.140.a.2 of these test procedures), medium heavy-duty engines are primarily intended for class 6 and 7 vehicles. As such, the DDP procedures for medium heavy-duty diesel engines would be applicable to diesel hybrid powertrains used in class 6 and 7 vehicles.

The current durability program is described in Chapter I, Section B.8 of this Staff Report, while current hybrid powertrain certification procedures are described in Chapter I, Section B.9. The need for changes to the durability program is described in Chapter II, Section C.8., while the need for changes to the hybrid powertrain certification procedures is described in Chapter I, Section C.9. Finally, a description of proposed durability program amendments is included in Chapter III, Section A.8, while a description of proposed hybrid powertrain certification procedure amendments is included in Chapter III, Section A.9.

Subparagraph 2.4

Purpose
The purpose of this subparagraph is to identify the requirements for diesel hybrid powertrains used in class 8 vehicles.

Rationale
The GVWR for class 8 vehicles is greater than 33,000 lbs. Under the definition of primary intended service class (section 1036.140.a.3 of these test procedures), heavy heavy-duty engines are primarily intended for class 8 vehicles. As such, the DDP procedures for heavy heavy-duty diesel engines will be applicable to diesel hybrid powertrains used in class 8 vehicles.

The current durability program is described in Chapter I, Section B.8 of this Staff Report, while current hybrid powertrain certification procedures are described in Chapter I, Section B.9. The need for changes to the durability program is described in Chapter II, Section C.8., while the need for changes to the hybrid powertrain certification procedures is described in Chapter I, Section C.9. Finally, a description of proposed durability program amendments is included in Chapter III, Section A.8, while a description of proposed hybrid powertrain certification procedure amendments is included in Chapter III, Section A.9.

Subparagraph 2.5

Purpose
The purpose of this subparagraph is to reduce the testing burden on diesel hybrid powertrain manufacturers that use certified on-road heavy-duty diesel engines.

Rationale
In order to reduce the testing burden on diesel hybrid powertrain manufacturers that use certified heavy-duty diesel engines, manufacturers would only be required to conduct durability testing on hybrid related components. This is due to the fact that these manufacturers have already conducted a DDP program on the engine and emission-related components. Therefore, there is no need to redo the DDP for the engine. This is further described in Chapter III, Section A.9 of this Staff Report.

The current durability program is described in Chapter I, Section B.8 of this Staff Report, while current hybrid powertrain certification procedures are described in Chapter I, Section B.9. The need for changes to the durability program is described in Chapter II, Section C.8., while the need for changes to the hybrid powertrain certification procedures is described in Chapter I, Section C.9. Finally, a description of proposed durability program amendments is included in Chapter III, Section A.8.

Subparagraph 2.6

Purpose
The purpose of this subparagraph is to clarify the requirements for manufacturers that do not use certified on-road heavy-duty diesel engines in the hybrid powertrain architecture.

Rationale
This clarification is needed to inform the manufacturers that if they do not use a certified engine in their hybrid powertrain architecture, then the complete powertrain package including the engine, the aftertreatment system, and the hybrid related components must undergo the applicable DDP requirements. This is further described in Chapter III, Section A.9 of this Staff Report.

The current durability program is described in Chapter I, Section B.8 of this Staff Report, while current hybrid powertrain certification procedures are described in Chapter I, Section B.9. The need for changes to the durability program is described in Chapter II, Section C.8., while the need for changes to the hybrid powertrain certification procedures is described in Chapter I, Section C.9. Finally, a description of proposed durability program amendments is included in Chapter III, Section A.8.

30. Certification. [§86.xxx-30]

A. Federal Provisions.

B. California Provisions

Paragraph 1

Purpose
This California provision was created to inform manufacturers that carryover or carry across applications shall not be allowed for engine families 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 for.

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 the 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 would 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 part is not available for the upcoming model year. It would not be reasonable for CARB to certify an engine family or test group if CARB was aware that there was 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]

A. Federal Provisions.

B. California provisions.

Paragraph 6

Purpose

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

Rationale
This amendment is necessary to require 2022 and subsequent model year diesel hybrid powertrains optionally certified pursuant to title 13, CCR §1956.8 to be subject to the labeling requirements as specified in this paragraph. 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 diesel hybrid powertrains with heavy-duty diesel 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 6.1

Purpose
The purpose of this subparagraph is to include a statement in the label identifying diesel hybrid powertrains that certify to the optional 50-state-directed emission standards.

Rationale
This amendment is necessary to require 2022 and subsequent model year diesel 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. This amendment would provide additional flexibilities for diesel 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.

Paragraph 7

Purpose
Proposed new addition paragraph 7 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 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 emissions 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 emissions standards are described in section 1.1.1.2 of the Staff Report.

38. Maintenance instructions. [§86.xxx-38]

A. Federal provisions.

Subparagraph 2.1

Purpose
The purpose of this amendment is to create a new subparagraph to maintain alignment with the federal requirements in §40 CFR §86.010-38(a) through (a)(2) for which no change is required.

Rationale
This amendment is necessary for maintaining the direct incorporation of the federal requirements in §40 CFR §86.010-38(a) through (a)(2) while allowing CARB staff to propose amending other portions of §40 CFR §86.010-38 that are currently incorporated without change.

Subparagraph 2.2

Purpose
The purpose of this amendment is to create a new subparagraph to prevent a manufacturer's maintenance instructions from prohibiting the use of commercially available diesel and biofuel blends that meet California's fuel specifications

Rationale

This amendment is necessary to ensure that manufacturers do not prohibit the use of CARB-approved fuels via a statement in the manufacturer's maintenance instructions or deny warranty based on the use of such fuels. Manufacturers are required to furnished to the purchaser of each new motor vehicle or motor vehicle engine written instructions for the proper maintenance and use of the vehicle or engine. The maintenance instructions required by this section must be clear and in nontechnical language. This amendment prohibits manufacturers from specifying in their maintenance instructions that commercially available diesel and biofuel blends that meet California's fuel

specifications in title 4, CCR, section 4148 for 2024 and subsequent may not be used in their engines. Manufacturers need to be calibrating and engineering their products to be compliant on all legal commercially available fuels, and any such fuels are fair game for use in the HDIUT and HDIUC programs. The amendment in paragraph 2.2 includes 2024 as the first effective model year to provide manufacturers who currently prohibit the draining and refilling of prospective test engine fuel tanks with a CARB-approved biodiesel fuel blend (via their service manuals) with sufficient lead time to calibrate and/or reengineer their engines to comply with all applicable emission standards and in-use compliance testing procedures when operated on any CARB-approved biodiesel fuel blend.

The current HDIUT 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.

Subparagraph 2.3

Purpose
The purpose of this amendment is to create a new subparagraph to maintain alignment with the federal requirements in §40 CFR §86.010-38(b) through (f) for which no change is required.

Rationale
This amendment is necessary for maintaining the direct incorporation of the federal requirements in §40 CFR §86.010-38(b) through (f) while allowing CARB staff to propose amending other portions of §40 CFR §86.010-38 that are currently incorporated without change.

Subparagraph 2.4

Purpose
The purpose of this amendment is to renumber subparagraph 2.2 as subparagraph 2.4.

Rationale
This amendment is necessary to maintain sequence with the other subparagraphs in this section after the inclusion of new subparagraphs 2.2 and 2.3.

Subparagraph 2.5

Purpose
The purpose of this amendment is to renumber subparagraph 2.3 as subparagraph 2.5.

Rationale
This amendment is necessary to maintain sequence with the other subparagraphs in this section after the inclusion of new subparagraphs 2.2 and 2.3.

Subparagraph 2.6

Purpose
The purpose of this amendment is to renumber subparagraph 2.4 as subparagraph 2.6.

Rationale
This amendment is necessary to maintain sequence with the other subparagraphs in this section after the inclusion of new subparagraphs 2.2 and 2.3.

Subparagraph 2.7

Purpose
The purpose of this amendment is to renumber subparagraph 2.5 as subparagraph 2.7.

Rationale
This amendment is necessary to maintain sequence with the other subparagraphs in this section after the inclusion of new subparagraphs 2.2 and 2.3.

II. Test Procedures

86.1333 Transient test cycle generation.

B. California provisions.

Paragraph 1

Purpose
The purpose of paragraph 1 and subparagraphs 1.1 and 1.2 is to identify the allowable accessory loads for the LLC.

Rationale
The need for the introduction of the LLC was described in Chapter II, section C.1.1, and the applicable emissions standards for the LLC were described in Chapter III, Section A.1.1.1 of this Staff Report. Paragraph 1 allows the manufacturers to use the applicable accessory loads that were specified in the Greenhouse Gas Emission model (GEM). Subparagraph 1.1 specifies the numerical values of the accessory loads for the different primary intended service classes. Subparagraph 1.2 requires manufacturers to treat long idle segments (longer than 200 seconds) within the LLC with no transmission load. Staff believes that these long idle segments are supposed to represent events where the vehicle is parked and therefore, no transmission load is allowed. Heavy-duty vehicles normally idle for extended periods of time with accessories such as air conditioning, air compressor, etc., operating. Inclusion of accessory loads in the low load cycle represents the presence of these loads during real-life operations.

Paragraph 2

Purpose
The purpose of paragraph 2 is to describe the process for unnormalizing the proposed LLC second-by-second engine speed and torque values.

Rationale
Similar to the FTP cycle, the engine speed and torque values for the LLC have been normalized so that each engine test would correspond to the maximum speed and torque value for the specific engine. Paragraph 2 describes the process that each manufacturer must follow to unnormalize the speed and torque values for each specific engine family. Similar to the FTP cycle, engine torque and speed values for the LLC cycle are also provided in normalized values. In order to perform an emissions test, manufacturers must unnormalize the torque and speed values for each specific engine family. This methodology ensures that all engines are tested under similar torque and speed values relative to the maximum engine speed and torque value.

86.1370 Not-To-Exceed.

A. Federal Provisions.

Paragraph 1

Purpose
The purpose of this amendment is to sunset the existing Not-To-Exceed in-use testing requirements for heavy-duty diesel engines after the 2023 model year in favor of the in-use testing approach described in subparagraph 86.1370(B)(6) of these test procedures beginning in 2024.

Rationale
This amendment is necessary to provide manufacturers with sufficient lead time to transition to a more representative and reliable MAW based in-use compliance testing approach. Manufacturers would use the lead time to ensure that their emission control systems comply with emission standards under real-world operating conditions as well as during standardized test cycle evaluations. More representative in-use compliance testing confirms that emissions are being adequately controlled during a greater portion of off-cycle operating conditions, which is necessary in realizing the emission reduction benefits of the emissions standards.

The current HDIUT 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.

Subparagraph 2.3

Purpose
The purpose of this amendment is to sunset features of the existing Not-To-Exceed in-use testing requirements for heavy-duty diesel engines that allow manufacturers to petition the Executive Officer for the evaluation of different engine families and for alternative testing conditions after the 2023 model year in favor of the in-use testing approach described in subparagraph 86.1370(B)(6) of these test procedures beginning in 2024.

Rationale
This amendment is necessary to provide manufacturers with sufficient lead time to transition to a more representative and reliable MAW based in-use compliance testing approach. Manufacturers would use the lead time to ensure that their emission control systems comply with emission standards under real-world operating conditions as well as during standardized test cycle evaluations. More representative in-use compliance testing confirms that emissions are being adequately controlled during a greater portion of off-cycle operating conditions, which is necessary in realizing the emission reduction benefits of the emissions standards.

The current HDIUT 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.

Subparagraph 4.1(iii)

Purpose
The purpose of this amendment is to sunset the existing Not-To-Exceed in-use testing multiplier of 1.5 for individual NOx or NMHC emissions for heavy-duty diesel engines after the 2023 model year in favor of the in-use testing approach described in subparagraph 86.1370(B)(6) of these test procedures beginning in 2024.

Rationale
This amendment is necessary to provide manufacturers with sufficient lead time to transition to a more representative and reliable MAW based in-use compliance testing approach. Manufacturers would use the lead time to ensure that their emission control systems comply with emission standards under real-world operating conditions as well as during standardized test cycle evaluations. More representative in-use compliance testing confirms that emissions are being adequately controlled during a greater portion of off-cycle operating conditions, which is necessary in realizing the emission reduction benefits of the emissions standards.

The current HDIUT 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.

Subparagraph 4.1(iv)

Purpose
The purpose of this amendment is to sunset the existing Not-To-Exceed in-use testing multiplier of 1.25 for combined NOx or NMHC emissions for heavy-duty diesel engines after the 2023 model year in favor of the in-use testing approach described in subparagraph 86.1370(B)(6) of these test procedures beginning in 2024.

Rationale
This amendment is necessary to provide manufacturers with sufficient lead time to transition to a more representative and reliable MAW based in-use compliance testing approach. Manufacturers would use the lead time to ensure that their emission control systems comply with emission standards under real-world operating conditions as well as during standardized test cycle evaluations. More representative in-use compliance testing confirms that emissions are being adequately controlled during a greater portion of off-cycle operating conditions, which is necessary in realizing the emission reduction benefits of the emissions standards.

The current HDIUT 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.

Subparagraph 4.1(v)

Purpose
The purpose of this amendment is to sunset the existing Not-To-Exceed in-use testing multiplier of 1.5 for PM emissions for heavy-duty diesel engines after the 2023 model year in favor of the in-use testing approach described in subparagraph 86.1370(B)(6) of these test procedures beginning in 2024.

Rationale
This amendment is necessary to provide manufacturers with sufficient lead time to transition to a more representative and reliable MAW based in-use compliance testing approach. Manufacturers would use the lead time to ensure that their emission control systems comply with emission standards under real-world operating conditions as well as during standardized test cycle evaluations. More representative in-use compliance testing confirms that emissions are being adequately controlled during a greater portion of off-cycle operating conditions, which is necessary in realizing the emission reduction benefits of the emissions standards.

The current HDIUT 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.

Subparagraph 4.3

Purpose
The purpose of this amendment is to sunset the smoke opacity-related elements of the Not-To-Exceed testing requirements for heavy-duty diesel engines after the 2023 model year in favor of the in-use testing approach described in subparagraph 86.1370(B)(6) of these test procedures beginning in 2024.

Rationale
This amendment is necessary to provide manufacturers with sufficient lead time to transition to a more representative and reliable MAW based in-use compliance testing approach. Manufacturers will use the lead time to ensure that their emission control systems comply with emission standards under real-world operating conditions as well as during standardized test cycle evaluations. More representative in-use compliance testing confirms that emissions are being adequately controlled during a greater portion of off-cycle operating conditions, which is necessary in realizing the emission reduction benefits of the emissions standards.

The current HDIUT 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 5

Purpose
The purpose of this amendment is to remove reference to §86.1375 of the test procedures because the section no longer exists, and to replace it with an updated reference to Part 1065, Subpart J.

Rationale
This amendment is necessary because §86.1375, which pertained to field testing and portable emission measurement systems, ceased to exist in the Code of Federal Regulations after U.S. EPA consolidated the requirements into Part 1065, Subpart J, for multiple mobile source platforms including nonroad, locomotives, marine, and 2010 and subsequent model year heavy-duty highway engines. The updated reference to Part 1065, Subpart J does not affect the applicability or stringency of the requirements in §86.1375, but instead harmonizes the referencing of the requirements with respect to the CFR and CARB test procedures to facilitate compliance for certifying entities.

The current HDIUT 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.

Paragraph 6

Purpose
The purpose of this amendment is to create a new Paragraph 6 introducing the binned moving average window (3B-MAW) approach that replaces the existing NTE approach for in-use compliance and the manufacturer run in-use testing program beginning with the 2024 model year.

Rationale
This amendment is necessary because it provides a more representative and reliable strategy for conducting in-use compliance testing than the currently required NTE approach. The advantage of more representative and reliable in-use compliance procedures 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. 3B-MAW is more representative than NTE because it collects emissions data continuously into 300 second windows during off-cycle operating conditions instead of only during narrowly predefined windows of operation. This is important for evaluating emissions control during low-load conditions where NOx control can be most challenging due to inefficient heat retention by the NOx aftertreatment. 3B-MAW is more reliable than NTE because it relates 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. Vehicles that have been tested under the manufacturer run in-use testing program for heavy-duty vehicles, specified in the subpart to Part 86 of the test procedures, have been known to pass NTE evaluations with malfunctioning aftertreatment, whereas these same vehicles would have been identified as non-compliant had the 3B-MAW testing protocols been employed. The European Union employs a somewhat similar work-based in-use compliance testing approach as the 3B-MAW, which has shown greater potential in identifying non-compliant vehicles in-use than the NTE protocol. The 3B-MAW protocol would improve upon the European approach in that it includes three separate standards for three separate regimes of operation – idle, low-load, and medium/high load. In addition, multiple data segments would be evaluated both discretely and comprehensively, ensuring that malfunctions which occur only during certain operating conditions, such as idle or low loads, would still be identified.

The current HDIUT 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.

Subparagraph 6.1

Purpose
The purpose of this amendment is to create a new Subparagraph 6.1 that defines the fundamental parameters of the 3B-MAW approach.

Rationale
This amendment is necessary because it identifies the pollutants to be evaluated as HC, CO, NOx, 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 greater than or equal to 1 Hertz.

The current HDIUT 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.

Subparagraph 6.2

Purpose
The purpose of this amendment is to create a new Subparagraph 6.2 identifying conditions for which data may not be used in calculating 3B-MAW values. These exclusions are detailed in subparagraphs 6.2.1 through 6.2.6.

Rationale

This amendment is necessary to ensure that valid 3B-MAW testing occurs within the design tolerances of the portable emissions measurement instrumentation to ensure test to test repeatability and reliable emission measurements. Subparagraph 6.2.1 ensures that the portable emissions measurement system is properly calibrated and operating within acceptable parameters prior to the start of testing. Subparagraph 6.2.2 ensures that valid 3B-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 6.2.3 ensures that valid 3B-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 6.2.4 ensures that valid 3B-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 6.2.5 ensures that valid 3B-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 3B-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 6.2.6 and descendant subparagraphs 6.2.6.1 and 6.2.6.2 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 3B-MAW test, as discussed later in Subparagraph 6.3.1 of this section, but data collected during such operating conditions shall not be used in calculating 3B-MAW test results until the 2027 model year.

The current HDIUT 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.

Subparagraph 6.3

Purpose

The purpose of this amendment is to create a new Subparagraph 6.3 defining the conditions for which a 3B-MAW test is considered valid. These conditions are detailed in subparagraphs 6.3.1 through 6.3.3.

Rationale
This amendment is necessary for ensuring that 3B-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 3B-MAW test is considered invalid and must be attempted at a different time. Subparagraph 6.3.1 identifies the parameters to be measured for conducting a valid 3B-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 6.3.2 stipulates that the duration of a valid 3B-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 6.3.3 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. This is necessary to ensure that the vehicle has operated under sufficient loading during the 3B-MAW test to maintain thermal management of the aftertreatment systems for representative emissions control.

The current HDIUT 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.

Subparagraph 6.4

Purpose
The purpose of this amendment is to create a new Subparagraph 6.4 defining the period of a 3B-MAW Window as 300 seconds of valid data. The 3B-MAW Window is the principle averaging set in the 3B-MAW testing procedure.

Rationale
This amendment is necessary because it standardizes the time period of the 3B-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 3B-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.

The current HDIUT 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.

Subparagraph 6.5

Purpose
The purpose of this amendment is to create a new Subparagraph 6.5 explaining the process for calculating Normalized Average CO2.

Rationale
This amendment is necessary because Normalized Average CO2 is the mechanism for determining the bin in which a 3B-MAW Window belongs as explained in subparagraph 6.6 of this section of the test procedures. The first step in the process of calculating Normalized Average CO2 is to determine the average rate of CO2 emissions over each 300 second 3B-MAW Window (in grams per hour). The second step is to multiply the CO2 family emission level for the engine family being tested (in grams per horsepower-hour) by the maximum rated power of the engine (in horsepower). The resulting product is an estimate of the CO2 emission rate at maximum rated horsepower. The third step normalizes CO2 emissions over each 300 second 3B-MAW Window by dividing the average rate of CO2 emissions for each 3B-MAW Window by the theoretical maximum CO2 emissions rate for the engine family being evaluated. This quotient results in the unit-less Normalized Average CO2 value for a 3B-MAW Window and is used to assign each Window into one of the three bins defined in subparagraph 6.6 of this section of the test procedures.

The current HDIUT 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.

Subparagraph 6.6

Purpose
The purpose of this amendment is to create a new Subparagraph 6.6 describing the three categories, i.e., bins, into which 3B-MAW Windows are categorized. A description of each of these bins is provided in subparagraphs 6.6.1 through 6.6.3.

Rationale
This amendment is necessary to ensure the reliability of 3B-MAW testing under the wide range of operating conditions encountered by heavy-duty engines. Poor

emissions control performance in any of the bins can trigger a failure of the test, whereas under NTE testing poor emissions control performance under certain conditions, such as idle and light loads, were more likely to be absorbed by normal performance under higher loads. Subparagraph 6.6.1 defines the Idle Bin as the collection of 3B-MAW Windows for which Normalized Average CO2 is less than or equal to 0.06 (or 6 percent of the maximum CO2 emissions rate of the test engine). Subparagraph 6.6.2 defines the Low-Load Bin as the collection of 3B-MAW Windows for which Normalized Average CO2 is greater than 0.06 (or 6 percent) but less than 0.20 (or 20 percent of the maximum CO2 emissions rate of the test engine). Subparagraph 6.6.3 defines the Medium/High-Load Bin as the collection of 3B-MAW Windows for which Normalized Average CO2 is greater than 0.20 (or 20 percent of the maximum CO2 emissions rate of the test engine).

The current HDIUT 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.

Subparagraph 6.7

Purpose
The purpose of this amendment is to create a new Subparagraph 6.7 describing the criteria for determining in-use compliance for each of the 3B-MAW emission bins in subparagraph 6.6.

Rationale
This amendment is necessary because it standardizes 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 for the Low-Load and Medium/High-Load bins is calculated as the ratio of summed modal mass emissions for each pollutant, i.e., HC, CO, NOx, 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 SOS calculation for the Idle Bin is simply the mass model average for each pollutant projected on an hourly basis. The determination of compliance is made by comparing the SOS value for each pollutant in each bin to the threshold value for each bin. The threshold values are the applicable emission standards for each bin multiplied by a conformity factor of 1.5. The applicable emission standards are based on the test cycle associated with the bin and are specified in 13, CCR, §1956.8 of the regulations. If the SOS value for each pollutant for each bin 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 HDIUT 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.

Paragraph 7

Purpose
New Paragraph 7 describes the proposed process for in-use compliance testing for idling emissions that would be conducted by CARB to determine compliance with the NOx idling emissions standards for 2024 and subsequent model medium-duty diesel engines used in vehicles 10,001 – 14,000 pounds GVWR and heavy-duty diesel engines used vehicles with GVWR greater than 14,000 pounds.

Rationale
This option is necessary to provide CARB the ability to conduct its own testing to verify compliance with the idling emissions standards and to legally hold the manufacturer responsible for any non-compliance with the idling emissions requirements for 2024 and subsequent model medium- and heavy-duty diesel engines. A description of the proposed heavy-duty in-use compliance testing for idling emissions amendments is included in Chapter III, Section A.3.3.

Subparagraphs 7.1 through 7.5

Purpose
Subparagraph 7 is new subparagraph added to describe the proposed process for in-use compliance testing for idling emissions. Subparagraphs 7.1 through 7.5 describe the methods, equipment, and procedures CARB would follow to conduct the in-use compliance and determine compliance.

Rationale
The new subparagraphs are necessary to provide CARB the means for checking compliance with the idling emission standards. It would also inform manufacturers of CARB's intent and the methods and test procedures that CARB would follow to determine compliance with the proposed idling emissions standards for 2024 and subsequent model year diesel engines. The methods to be used to measure emissions are described so that manufacturers would understand and design their engines appropriately to comply with the in-use requirements.

In order to determine compliance with the proposed idling emission requirements, CARB would test the engine in-use at idle speeds of up to 1,100 rpm under stabilized conditions. The testing would be conducted using portable emissions measurement systems or in a laboratory using chassis dynamometer. Similar to the certification test, the vehicle would be tested under stabilized conditions with vehicle accessories functioning properly and with (or without) the air conditioning or heating load set at maximum capacity. Emissions are collected for at least 30 minutes for a specific idle speed and compared to the emissions standards to determine compliance. The proposed in-use compliance testing program would provide CARB with the ability to

assess the emissions performance of the engines while in-use, and pursue corrective action if warranted.

A description of the proposed heavy-duty in-use compliance testing for idling emissions amendments is included in Chapter III, Section A.3.3.

Subpart T - Manufacturer-Run In-Use Testing Program for Heavy-Duty Diesel Engines.

86.1905 How does this program work?

Paragraph 1

Purpose
The purpose of this amendment is to create a new paragraph 1 updating the contact person and address where industry may contact the California Air Resources Board related to the manufacturer-run in-use testing program.

Rationale
This amendment is necessary because by the time these proposed amendments become effective, CARB staff responsible for administering the manufacturer-run in-use testing program will have relocated from El Monte, CA, to Riverside, CA.

86.1908 How must I select and screen my in-use engines?

Subparagraph 1.1

Purpose
The purpose of this amendment is to define a range of alignment with the federal definitions in 40 CFR §86.1908 from subparagraph (a)(1) through (a)(5) for which no change is required.

Rationale
This amendment is necessary because CARB staff is proposing to amend subparagraph (a)(6) which occurs in the existing range from subparagraph (a)(1) through (a)(8) for which no change from the federal requirements is currently required.

Subparagraph 1.2

Purpose
The purpose of this amendment is to insert a new subparagraph 1.2 clarifying that engines fueled with CARB-approved biodiesel fuel blends are not considered to be misfueled.

Rationale
This amendment is necessary because the existing language in §86.1908(a)(6) can be misinterpreted to mean that any biodiesel fuel blend not specifically mentioned as acceptable in the owner's manual constitutes misfueling. As mentioned above, manufacturers need to be calibrating and engineering their products to be compliant on all legal commercially available fuels, and any such fuels are fair game for use in the HDIUT and HDIUC programs.

The current HDIUT 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.

Subparagraph 1.3

Purpose
The purpose of this amendment is to insert a new subparagraph 1.3 defining a range of alignment with federal requirements in the test procedures for which no change is required.

Rationale
This amendment is necessary to maintain alignment with the federal requirements in 40 CFR §86.1908 from subparagraph (a)(7) through (a)(8).

Subparagraph 1.4

Purpose
The purpose of this amendment is to renumber subparagraph 1.2 as subparagraph 1.4.

Rationale
This amendment is necessary to maintain sequence with the other subparagraphs in this section after the inclusion of new subparagraph 1.3.

Subparagraph 1.5

Purpose
The purpose of this amendment is to renumber subparagraph 1.3 as subparagraph 1.5.

Rationale
This amendment is necessary to maintain sequence with the other subparagraphs in this section after the inclusion of new subparagraph 1.3.

86.1910 How must I prepare and test my in-use engines?

A. Federal Provisions.

Paragraph 1

Purpose
The purpose of this amendment is to create a new paragraph 1 that maintains alignment with the federal requirements in 40 CFR §86.1910 from paragraph (a) through (b) for which no change is required.

Rationale
This amendment is necessary to indicate alignment with the first two paragraphs in

40 CFR §86.1910 while allowing CARB staff to propose amending other portions of 40 CFR §86.1910 that are currently incorporated without change.

Paragraph 2

Purpose
The purpose of this amendment is to create a new paragraph 2 proposing modifications to section 86.1910(c) of the test procedures that specifically allow the use of CARB-approved biodiesel fuel blends for the preparation and testing of in-use engines.

Rationale
This amendment is necessary to prevent manufacturers from prohibiting the use of CARB-approved biodiesel fuel blends via a statement in the owner's manual after the 2023 model year. Fleets that operate primarily on CARB-approved biodiesel fuel should not be required to perform in-use emissions testing using another type of fuel just because the manufacturer includes a statement in the owner's manual prohibiting the use of that specific fuel. Doing so could add additional costs to the test program, and the test result using a different fuel might not be representative of typical emissions performance of an engine that operates primarily on CARB-approved biodiesel fuel blends.

The current HDIUT 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.

Subparagraph 2.1

Purpose
The purpose of this amendment is to create a new subparagraph 2.1 that maintains alignment with the federal requirements in 40 CFR §86.1910(c)(1) for which no change is required.

Rationale
This amendment is necessary for maintaining the direct incorporation of the federal requirements in 40 CFR §86.1910(c)(1) while allowing CARB staff to propose amending other portions of 40 CFR §86.1910 that are currently incorporated without change.

The current HDIUT 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.

Subparagraph 2.2

Purpose

The purpose of this amendment is to create a new subparagraph 2.2 that sunsets the ability of manufacturers in 40 CFR §86.1910(c)(2) to independently prohibit the use of any CARB-certified biodiesel fuel blend for the preparation and in-use testing of heavy-duty diesel engines after the 2023 model year, and to require the acceptance of any CARB-approved, commercially available biofuel blend beginning in 2024. These amendments are detailed in dependent subparagraphs 2.2(i) through 2.2(ii).

Rationale
This amendment in new subparagraph 2.2(i) is necessary to provide manufacturers who currently prohibit the use of a CARB-approved biodiesel fuel blend (via their service manuals) with sufficient lead time to calibrate and/or reengineer their engines to comply with all applicable emission standards and in-use compliance testing procedures when operated on any CARB-approved biodiesel fuel blend. New subparagraph 2.2(ii) requires manufacturers to accept any CARB-approved commercially available biodiesel fuel blend for the preparation and in-use compliance testing of heavy-duty diesel engines beginning with the 2024 model year. In-use compliance testing confirms that emissions are being adequately controlled during off-cycle operating conditions, which is more representative of engine operation when testing occurs using the same fuel that powers the engine in day to day operations, and is necessary for realizing the emission reduction benefits of the emissions standards.

The current HDIUT 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.

Subparagraph 2.3

Purpose
The purpose of this amendment is to create a new subparagraph 2.3 that sunsets the ability of manufacturers in 40 CFR §86.1910(c)(3) to independently prohibit the draining and refilling of the fuel tank of a prospective test engine with a CARB-certified biodiesel fuel blend prior to in-use testing after the 2023 model year, and to require the acceptance of any CARB-approved, commercially available biofuel blend beginning in 2024. These amendments are detailed in proposed dependent subparagraphs 2.3(i) through 2.3(ii) of these test procedures.

Rationale
This amendment in new subparagraph 2.3(i) is necessary to provide manufacturers who currently prohibit the draining and refilling of prospective test engine fuel tanks with a CARB-approved biodiesel fuel blend (via their service manuals) with sufficient lead time to calibrate and/or reengineer their engines to comply with all applicable emission standards and in-use compliance testing procedures when operated on any CARB-approved biodiesel fuel blend. New subparagraph 2.3(ii) requires manufacturers to accept any CARB-approved commercially available biodiesel fuel blend when draining

and refilling prospective engine fuel tanks prior to in-use compliance testing beginning with the 2024 model year. In-use compliance testing confirms that emissions are being adequately controlled during off-cycle operating conditions, which is more representative of engine operation when testing occurs using the same fuel that powers the engine in day to day operations, and is necessary for realizing the emission reduction benefits of the emissions standards.

The current HDIUT 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.

Subparagraph 2.4

Purpose
The purpose of this amendment is to create a new subparagraph 2.4 that maintains alignment with the federal requirements in 40 CFR §86.1910(c)(4) through (c)(6) for which no change is required.

Rationale
This amendment is necessary for maintaining the direct incorporation of the federal requirements in 40 CFR §86.1910(c)(4) through (c)(6) while allowing CARB staff to propose amending other portions of 40 CFR §86.1910 that are currently incorporated without change.

Paragraph 3

Purpose
The purpose of this amendment is to create a new paragraph 3 that maintains alignment with the federal requirements in 40 CFR §86.1910(d) for which no change is required.

Rationale
This amendment is necessary for maintaining the direct incorporation of the federal requirements in 40 CFR §86.1910(d) while allowing CARB staff to propose amending other portions of 40 CFR §86.1910 that are currently incorporated without change.

Paragraph 4

Purpose
The purpose of this amendment is to create a new paragraph 4 that modifies 40 CFR §86.1910(e) directing manufacturers to select test conditions that match normal vehicle operating conditions reasonably expected to be encountered during an NTE evaluation through the 2023 model year, and to select test conditions that match normal vehicle operating conditions reasonably expected to be encountered during a 3B-MAW evaluation for 2024 and subsequent model years.

Rationale
This amendment is necessary to maximize the number of valid data points that are made available for in-use compliance testing under the existing NTE approach and the proposed 3B-MAW approach. More data points improve the signal-to-noise characteristics of the test procedures which result in more reliable assessment of in-use compliance. A prime reason for sunsetting the NTE procedures in favor of the 3B-MAW procedures is that 3B-MAW is designed to capture significantly more information during the course of a typical work day for a heavy-duty engine. Normal vehicle operation that is reasonably expected to be encountered is defined for this provision as operation over the test vehicle's typical routes and loads (including auxiliary loads such as air conditioning in the cab), typically encountered ambient conditions, and operation by the driver who typically operates the vehicle.

The current HDIUT 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.

Paragraph 5

Purpose
The purpose of this amendment is to create a new paragraph 5 that maintains alignment with the federal requirements in 40 CFR §86.1910(f) for which no change is required.

Rationale
This amendment is necessary for maintaining the direct incorporation of the federal requirements in 40 CFR §86.1910(f) while allowing CARB staff to propose amending other portions of 40 CFR §86.1910 that are currently incorporated without change.

Paragraph 6

Purpose
The purpose of this amendment is to create a new paragraph 6 that modifies 40 CFR §86.1910(g) stipulating the conditions for collecting the minimum amount of data necessary to make a determination of in-use compliance for an NTE evaluation through the 2023 model year, and for a 3B-MAW evaluation for 2024 and subsequent model year engines. The amendments pertaining to data accumulation for an NTE evaluation are detailed in proposed dependent subparagraph 6(i) and the amendments pertaining to data accumulation for a 3B-MAW evaluation are detailed in proposed dependent subparagraph 6(ii) of these test procedures.

Rationale
This amendment is necessary to establish the minimum amount of data that must be collected in order to make a valid determination of in-use compliance. Both the NTE

and 3B-MAW in-use compliance procedures require a minimum of three hours of accumulated non-idle operation. Ideally, this operation is to be collected during a single shift day (defined as the period of a normal workday for an individual employee), but manufacturers have the option to combine operating time over two or more shift days, or they may choose to test a different vehicle. The primary differences between accumulating data and determining compliance under the NTE test procedures, specified in subparagraph 6(i), and the 3B-MAW test procedures, specified in subparagraph 6(ii), are the dates of applicability and the lack of an option to test under the Phase 2 test plan for the 3B-MAW approach. The dates of applicability for these provisions correspond to the sunsetting period of the NTE approach, i.e., through the 2023 model year, and the adoption of the 3B-MAW approach beginning with 2024 and subsequent model year engines. The elimination of the option to continue testing during the Phase 2 test plan beginning in 2024 is meant to accelerate the determination of a non-compliant engine and to expedite the implementation of corrective action when necessary. The current allowance for Phase 2 testing has introduced significant delays in determining non-compliance using the NTE approach. Delays in determining non-compliant engines reduce the effectiveness of CARB's heavy-duty in-use compliance program to take corrective action against high emitting engines, which results in higher emissions throughout the State.

The current HDIUT 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.

Paragraph 7

Purpose
The purpose of this amendment is to create a new paragraph 7 that maintains alignment with the federal requirements in 40 CFR §86.1910(h) for which no change is required.

Rationale
This amendment is necessary for maintaining the direct incorporation of the federal requirements in 40 CFR §86.1910(h) while allowing CARB staff to propose amending other portions of 40 CFR §86.1910 that are currently incorporated without change.

Paragraph 8

Purpose
The purpose of this amendment is to create a new paragraph 8 that sunsets the provision in 40 CFR §86.1910(i) after the 2023 model year allowing a manufacturer to count a vehicle that does not encounter a single valid NTE sampling event as passing the in-use compliance evaluation.

Rationale

This amendment is necessary to provide manufacturers with sufficient lead time to transition to the 3B-MAW in-use compliance testing approach beginning with the 2024 model year. 3B-MAW is designed to collect data continuously under more representative operating conditions than NTE; therefore, the need for a mechanism to address vehicles that do not encounter valid operating conditions under NTE is eliminated under 3B-MAW. Manufacturers would use the lead time to ensure that their emission control systems comply with emission standards under real-world operating conditions as well as during standardized test cycle evaluations. The more representative 3B-MAW in-use compliance testing would confirm that emissions are being adequately controlled during a greater portion of off-cycle operating conditions, which is necessary for realizing the emission reduction benefits of the emissions standards.

The current HDIUT 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.

Paragraph 9

Purpose
The purpose of this amendment is to create a new paragraph 9 that maintains alignment with the federal requirements in 40 CFR §86.1910(j) for which no change is required.

Rationale
This amendment is necessary for maintaining the direct incorporation of the federal requirements in 40 CFR §86.1910(j) while allowing CARB staff to propose amending other portions of 40 CFR §86.1910 that are currently incorporated without change.

86.1912 How do I determine whether an engine meets the vehicle-pass criteria?

A. Federal provisions.

Purpose
The purpose of this amendment is to indicate alignment with the federal requirements in 40 CFR §86.1912 for which no change is required.

Rationale
This amendment is necessary for maintaining the direct incorporation of the federal requirements in 40 CFR §86.1912 while allowing CARB staff to propose amending other portions of 40 CFR §86.1912 that are currently incorporated without change.

B. California provisions.

Paragraph 1

Purpose
The purpose of this amendment is to create a new paragraph 1 requiring the use of the 3B-MAW test procedures described in section 86.1307.B.6 of the test procedures to determine in-use compliance of heavy-duty vehicles in California beginning with the 2024 model year and subsequently thereafter.

Rationale
This amendment is necessary for authorizing the use of 3B-MAW test procedures to determine in-use compliance in California.

The current HDIUT 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.

Paragraph 2

Purpose
The purpose of this amendment is to create a new paragraph 2 requiring that all valid 3B-MAW Windows accumulated during the course of testing, even in excess of a single shift day, be used in determining whether a test passes or fails in California for heavy-duty vehicles beginning with the 2024 model year and subsequently thereafter.

Rationale
This amendment is necessary for maximizing the reliability of in-use compliance testing by requiring the use of all valid data points (3B-MAW Windows) that have been accumulated during all shift days. More data points improve the signal-to-noise characteristics of the test procedures, which results in more reliable assessments of in-use compliance.

The current HDIUT 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.

86.1915 What are the requirements for Phase 1 and Phase 2 testing?

A. Federal Provisions.

Paragraph 1

Purpose
The purpose of this amendment is to create a new paragraph 1 that maintains alignment with the federal requirements in 40 CFR §86.1915 from the introduction of the

paragraph through the entirety of subparagraph (a) for which no change is required.

Rationale
This amendment is necessary to maintain alignment with 40 CFR §86.1915 through subparagraph (a) while allowing CARB staff to propose amending other portions of 40 CFR §86.1915 that are currently incorporated without change.

Paragraph 2

Purpose
The purpose of this amendment is to create a new paragraph 2 that mimics the federal requirements in 40 CFR §86.1915(a)(1) regarding the number of test engines for an NTE evaluation except that an updated reference to 40 CFR part 1065, subpart J regarding emissions measurement procedures is substituted for the existing reference to §86.1375 which no longer exists in the federal regulations or the California test procedures.

Rationale
This amendment is necessary for ensuring that manufacturers are properly instructed on the measurement procedures for conducting an NTE evaluation prior to the implementation of 3B-MAW testing beginning with the 2024 model year and thereafter.

The current HDIUT 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.

Paragraph 3

Purpose
The purpose of this amendment is to create a new paragraph 5 that maintains alignment with the federal requirements in 40 CFR §86.1915(a)(2) through (c) for which no change is required.

Rationale
This amendment is necessary for maintaining the direct incorporation of the federal requirements in 40 CFR §86.1915(a)(4) through (c) while allowing CARB staff to propose amending other portions of 40 CFR §86.1915 that are currently incorporated without change.

B. California Provisions.

Paragraph 1

Purpose
The purpose of this amendment is to create a new paragraph 1 removing the

allowances for a second phase of in-use compliance testing (Phase 2) for 2024 and subsequent model year engines in California. The amendment also requires manufacturers to notify the CARB Executive Officer within 3 business days after an engine family is found to be in non-compliance because of Phase 1 testing, and to submit a plan to recall (or otherwise remedy) the affected engine family. The manufacturer would have to submit the plan to recall (or otherwise remedy) the affected engine family to the CARB Executive Officer within 45 days after notification of non-compliance.

Rationale
This amendment is necessary because the 3B-MAW protocol is more effective in accumulating valid data by which to make a determination of in-use compliance than the NTE protocol, and as such, does not require the additional testing opportunities afforded to NTE. Therefore, allowing a second phase of in-use compliance testing corresponding with the introduction of 3B-MAW would only result in delaying the determination of a non-compliant engine as well as the implementation of corrective action. The current allowance for Phase 2 testing has introduced significant delays in determining non-compliance using the NTE approach. Delays in determining non-compliant engines reduces the effectiveness of CARB's heavy-duty in-use compliance program to take corrective action against high emitting engines, which results in higher emissions throughout the State.

The current HDIUT 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.

Paragraph 2

Purpose
The purpose of this amendment is to create a new paragraph 2 requiring the exclusive use of the 3B-MAW methods in §86.1370.B.6 of these test procedures for evaluating in-use compliance for 2024 and subsequent model year heavy-duty engines in California.

Rationale
This amendment is necessary to replace the existing NTE in-use compliance methods described in §86.1912 of these test procedures with the 3B-MAW in-use compliance methods beginning with 2024 model year heavy-duty engines and thereafter. 3B-MAW provides a more representative and reliable strategy for conducting in-use compliance testing than NTE. The advantage of more representative and reliable in-use compliance procedures is the ability to confirm that emissions are being adequately controlled during a greater portion of an engine's off-cycle activity, which is necessary in realizing the full emission reduction benefits of the exhaust standards. 3B-MAW is more representative than NTE because it collects emissions data continuously into 300 second windows during off-cycle operating conditions instead of only during narrowly predefined windows of operation. This is important for evaluating emissions control

during low-load conditions where NOx control can be most challenging due to inefficient heat retention by the NOx aftertreatment. 3B-MAW is more reliable than NTE because it relates 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. Vehicles that have been tested under the manufacturer run in-use testing program for heavy-duty vehicles, specified in the subpart to Part 86 of these test procedures, have been known to pass NTE evaluations with malfunctioning aftertreatment, whereas these same vehicles would have been identified as non-compliant had the 3B-MAW testing protocols been employed.

The current HDIUT 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.

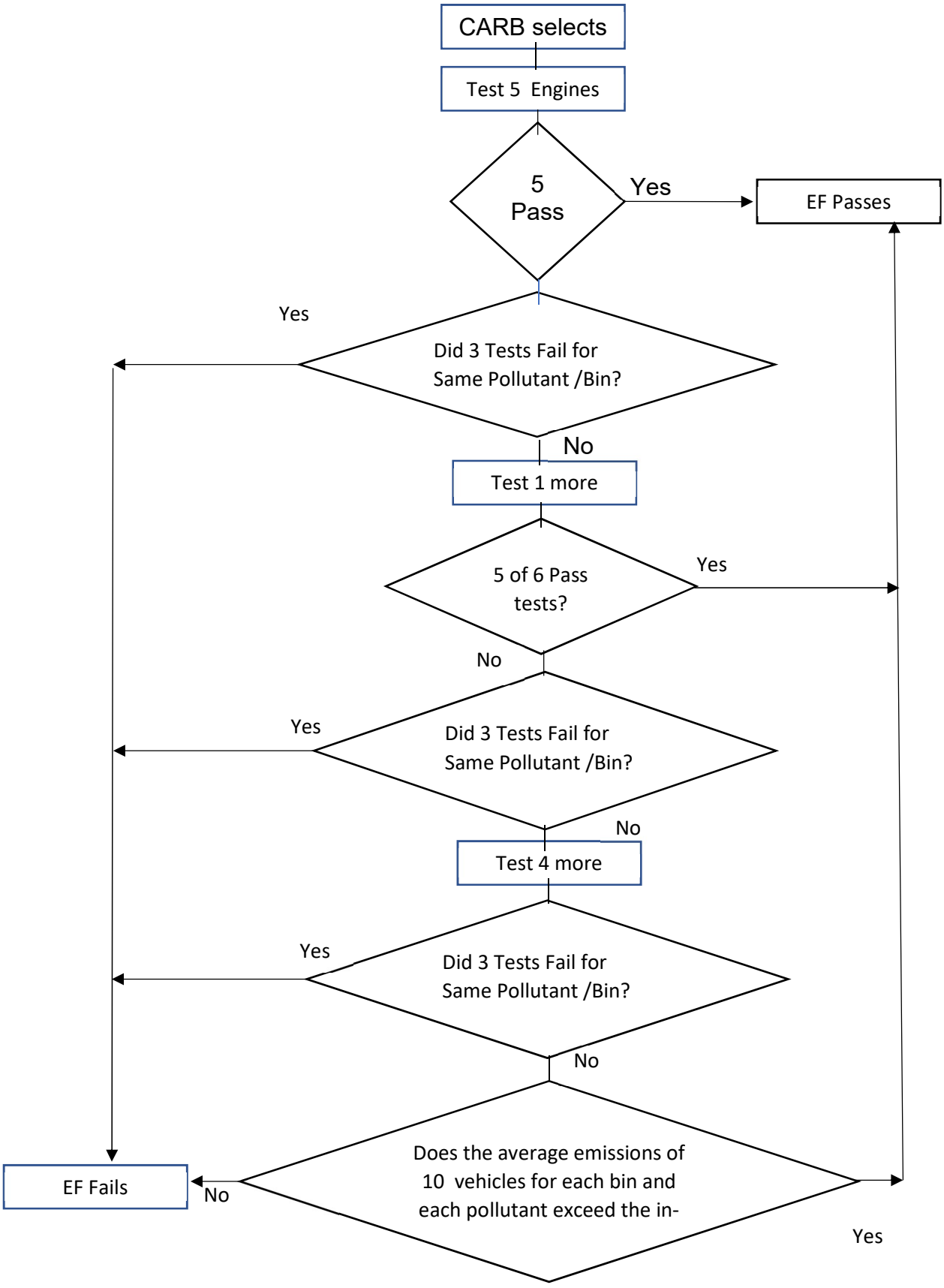
Paragraph 3

Purpose
The purpose of this amendment is to create a new paragraph 3 identifying the criteria for determining the non-compliance of an engine family under Phase 1 testing for 2024 and subsequent model year heavy-duty engines. The specifics of these criteria are detailed in dependent subparagraphs 3.1 and 3.2.

Rationale
This amendment is necessary to replace the existing NTE criteria for determining engine family non-compliances in California with the 3B-MAW criteria in §86.1370.B.6 of these test procedures beginning with 2024 model year heavy-duty engines and thereafter. Subparagraph 3.1 defines the first condition of non-compliance as an exceedance of the applicable 3B-MAW SOS Emissions In-use Threshold, described in §86.1370.B.6, for the same pollutant, i.e., NMHC, CO, NOx, or PM, in the same bin, i.e., Idle, Low-Load, or Medium/High-Load, in at least three valid tests. For example if the PM SOS calculation for the 2027 model year engines being tested exceeds 1.5 times the 2027 model year PM standard over the FTP or RMC test cycles, i.e., 1.5 x 0.005 g/bhp-hr = 0.0075 g/hp-hr, in the Medium/High-Load bin during any three of the Phase 1 evaluations, then the engine family is deemed to be non-compliant. This is true even if all other SOS calculations are less than their respective SOS Emissions In-use Thresholds for the same engines. Subparagraph 3.2 defines the second condition of non-compliance as an exceedance of the applicable 3B-MAW SOS Emissions In-use Threshold when the individual SOS calculations for the same pollutant in the same bin are averaged together for all 10 Phase 1 engines. This approach has the benefit of being able to identify an engine family as non-compliant should, for example, two of the ten Phase 1 engines fail egregiously for a particular pollutant in a particular bin while the other eight engines pass marginally. When averaged together, the two egregious failures could be enough to influence the average above the threshold. Such a failure would be indicative of the manufacturer failing to do due diligence in calibrating the

engine family with sufficient compliance margin to reasonably account for off-cycle operation. Together, the conditions in subparagraphs 3.1 and 3.2 provide a robust mechanism for confirming that heavy-duty engine families in California have been designed for acceptable emissions performance and durability during real-world operation.

The flow chart below depicts a graphical illustration of the summarized processes for determining compliant and non-compliant engine families:



Date of Release: June 23, 2020
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The current HDIUT 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.

Paragraph 4

Purpose
The purpose of this amendment is to create a new paragraph 4 that modifies subparagraph §86.1915 (a)(3) of the test procedures authorizing a determination of compliance or non-compliance using the NTE test procedures prior to testing the maximum of 10 engines should a manufacturer concede the engine family being tested is in non-compliance.

Rationale
This amendment is necessary to accelerate the determination of a non-compliant engine and to expedite the implementation of corrective action when necessary. Delays in determining non-compliant engines reduces the effectiveness of CARB's heavy-duty in-use compliance program to take corrective action against high emitting engines, which results in higher emissions throughout the State.

The current heavy-duty in-use test (HDIUT)HDIUT 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.

86.1920 What in-use testing information must I report to ARB?

A. Federal Provisions.

Paragraph 1

Purpose
The purpose of this amendment is to revise paragraph 1 to update the contact person and address where industry must submit in-use compliance reports to the California Air Resources Board related to the manufacturer-run in-use testing program.

Rationale
This amendment is necessary to modify the requirements in section 86.1920(a) of these test procedures because by the time these proposed amendments would become effective, CARB staff responsible for administering the heavy-duty in-use compliance program will have relocated from El Monte, CA, to Riverside, CA.

Paragraph 2

Purpose
The purpose of this amendment is to revise paragraph 2 to maintain alignment with the federal requirements in 40 CFR §86.1920(b)(1) through (b)(4)(vi) for which no change is required.

Rationale
This amendment is necessary for maintaining the direct incorporation of the federal requirements in 40 CFR §86.1920(b)(1) through (b)(4)(vi) while allowing CARB staff to propose amending other portions of 40 CFR §86.1920 that are currently incorporated without change. Previously this range of incorporation extended from paragraphs (b) through (c), but staff is proposing to amend paragraphs and subparagraphs in this range as part of this rulemaking.

Paragraph 3

Purpose
The purpose of this amendment is to create a new paragraph 3 that maintains the timing for measuring ambient temperature, dewpoint, and atmospheric pressure during an NTE evaluation through the 2023 model year, while updating the timing for measuring these same parameters during a 3B-MAW evaluation beginning with the 2024 model year and subsequently thereafter.

Rationale
This amendment is necessary to modify the requirements in section 86.1920(b)(vii) to ensure that ambient temperature, dewpoint, and atmospheric pressure will be measured at the appropriate times during 3B-MAW evaluations of in-use compliance. Currently, these parameters are required to be measured at the start and end of each valid NTE event, but NTE events are not defined under the 3B-MAW test procedures. Therefore, the amendments propose that these parameters be measured at the start and end of each valid 3B-MAW window, which is the principle data averaging set in the 3B-MAW testing procedure.

The current HDIUT 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.

Paragraph 4

Purpose
The purpose of this amendment is to create a new paragraph 4 that maintains the requirement to submit the number of valid NTE events during an NTE evaluation through the 2023 model year, while updating the requirement to submit the total number of 3B-MAW Windows and the number of Windows per bin during a 3B-MAW evaluation for 2024 model year and subsequent heavy-duty engines. The bifurcated requirements

are detailed in dependent subparagraphs 4(i) and 4(ii).

Rationale
This amendment is necessary to modify the requirements in section 86.1920(b)(viii) to ensure that meaningful and appropriate information is submitted with respect to 3B-MAW evaluations to make a determination of in-use compliance. Currently, only the number of valid NTE events are required to be reported to CARB, but NTE events are not defined under the 3B-MAW test procedures. Subparagraph (4)(i) maintains the status quo of requiring NTE events to be submitted through the 2023 model year. Subparagraph (4)(ii) propose that both the total number of 3B-MAW Windows and the number of Windows per bin be submitted for 2024 model year and subsequent heavy-duty engines. These data are necessary under the 3B-MAW approach to determine the in-use compliance of an engine family according to the requirements in section 86.1370.B.6 of these test procedures, whereas only NTE events are needed to make a determination of compliance under section 86.1912(b).

The current HDIUT 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.

Paragraph 5

Purpose
The purpose of this amendment is to create a new paragraph 5 that maintains the requirement for determining NMHC emissions during an NTE evaluation according to the provisions in 40 CFR part 1065, subpart J, through the 2023 model year, while updating the requirement to employ the provisions in section 86.1370.B.6 of these test procedures during a 3B-MAW evaluation for 2024 model year and subsequent heavy-duty engines.

Rationale
This amendment is necessary to modify the requirements in section 86.1920(b)(ix) to ensure alignment with the 3B-MAW measurement methods described in §86.1370.B.6 of these test procedures for 2024 model year and subsequent heavy-duty engines.

Paragraph 6

Purpose
The purpose of this amendment is to create a new paragraph 6 that maintains alignment with the federal requirements in 40 CFR §86.1920(b)(4)(x) for which no change is required.

Rationale
This amendment is necessary for maintaining the direct incorporation of the federal requirements in 40 CFR §86.1920(b)(4)(x) while allowing CARB staff to propose

amending other portions of 40 CFR §86.1920 that are currently incorporated without change.

Paragraph 7

Purpose
The purpose of this amendment is to create a new paragraph 7 that sunsets the incorporated provision in 40 CFR §86.1920(xi) after the 2023 model year, which requires manufacturers to submit NTE vehicle-pass ratios to CARB as part of the in-use compliance requirements.

Rationale
This amendment is necessary because NTE vehicle-pass ratios are not defined under the 3B-MAW test procedures, which as proposed would take effect for 2024 and subsequent model year heavy-duty vehicles.

The current HDIUT 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.

Paragraph 8

Purpose
The purpose of this amendment is to create a new paragraph 8 that maintains alignment with the federal requirements in 40 CFR §86.1920(b)(4)(xii) for which no change is required.

Rationale
This amendment is necessary for maintaining the direct incorporation of the federal requirements in 40 CFR §86.1920(b)(4)(xii) while allowing CARB staff to propose amending other portions of 40 CFR §86.1920 that are currently incorporated without change.

Paragraph 9

Purpose
The purpose of this amendment is to create a new paragraph 9 that sunsets the submission of several NTE-specific articles of in-use compliance after the 2023 model year, while updating the requirement to reference 3B-MAW-specific thresholds of in-use compliance for 2024 and subsequent model year heavy-duty engines. The specifics of these articles of compliance are detailed in dependent subparagraphs 9(i) through 9(iii).

Rationale
This amendment is necessary to modify the requirements in section 86.1920(b)(5) to ensure alignment with the 3B-MAW for 2024 and subsequent model year heavy-duty

engines. Subparagraph (9)(i) proposes to amend the thresholds for determining in-use compliance by sunsetting the submission of NTE compliance thresholds, described in §86.1912 of these test procedures, after the 2023 model year. This amendment also proposes to create a new requirement for manufacturers to submit 3B-MAW Emissions In-use Thresholds, described in §86.1370.B.6 of these test procedures, for the 2024 and subsequent model year engines being evaluated for in-use compliance. Subparagraph (9)(ii) proposes to sunset, after the 2023, model year the requirement to submit NTE-specific information identifying limited testing regions under NTE test procedure allowances. Subparagraph (9)(iii) proposes to sunset, after the 2023 model year, the requirement to submit NTE-specific information identifying approved NTE deficiencies. The proposed 3B-MAW test procedures do not include a similar mechanism for approving in-use compliance monitoring techniques that are not fully compliant.

The current HDIUT 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.

Paragraph 10

Purpose
The purpose of this amendment is to create a new paragraph 2 that maintains alignment with the federal requirements in 40 CFR §86.1920(b)(6) through (c) for which no change is required.

Rationale
This amendment is necessary for maintaining the direct incorporation of the federal requirements in 40 CFR §86.1920(b)(6) through (c) while allowing CARB staff to propose amending other portions of 40 CFR §86.1920 that are currently incorporated without change.

Paragraph 11

Purpose
The purpose of this amendment is to renumber existing paragraph 3 as new paragraph 11, and to revise section 86.1920(d) of these test procedures to reference a new and unique email address, i.e., hd-inuse@arb.ca.gov, for the purpose of notifying CARB regarding any voluntary emission evaluations that the manufacturer plans to conduct.

Rationale
This amendment is necessary to avoid confusion regarding the submission of information related to the heavy-duty in-use compliance program versus other in-use compliance programs administered by CARB.

The current HDIUT 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.

Paragraph 12

Purpose
The purpose of this amendment is to renumber existing paragraph 4 as new paragraph 12, and to revise section 86.1920(e) of these test procedures to reference a new and unique email address, i.e., hd-inuse@arb.ca.gov, for the purpose of notifying CARB within 15 days after a manufacturer first learns that three test engines in an evaluated engine family have failed Phase 1 in-use compliance testing.

Rationale
This amendment is necessary to avoid confusion regarding the submission of information related to the heavy-duty in-use compliance program versus other in-use compliance programs administered by CARB.

The current HDIUT 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.

Paragraph 13

Purpose
The purpose of this amendment is to renumber existing paragraph 5 as new paragraph 13 to maintain alignment with the federal requirements in 40 CFR §§86.1920(f) and (g) for which no change is required.

Rationale
This amendment is necessary for maintaining the direct incorporation of the federal requirements in 40 CFR §§86.1920(f) and (g) while allowing CARB staff to propose amending other portions of 40 CFR §86.1920 that are currently incorporated without change.

B. California Provisions.

Paragraph 1

Purpose
The purpose of this amendment is to create a new paragraph 1 requiring manufacturers to submit to CARB 37 data stream parameters collected at one second intervals during all 3B-MAW evaluations for 2024 and subsequent model year engines in California. The amendment also requires manufacturers to submit the data in a comma delimited file for each test.

Rationale
This amendment is necessary because the information proposed to be submitted to CARB will be used by CARB to better understand the off-cycle emissions characteristics of heavy-duty engines. A better understanding of emissions performance during off-cycle operation would lead to the development of more robust on-board diagnostics monitoring strategies and will be an effective metric assisting CARB's in-use compliance program identify unauthorized cycle beater activity more quickly than is currently possible under the existing off-board confirmatory process. The development of more robust on-board diagnostics would enable the detection of emissions-related malfunctions as they occur in-use affording the vehicle operator greater opportunity to affect emissions-related repairs in a timely manner, especially when the malfunction isn't adversely affecting vehicle performance. The list of parameters to be sampled and submitted to CARB include engine speed, actual engine torque, reference engine maximum torque, engine coolant temperature, engine oil temperature, fuel rate, modeled exhaust flow, intake air/manifold temperature, air flow rate (from mass air flow sensor), fuel injection timing, EGR mass flow rate, commanded EGR valve duty cycle/position, actual EGR valve duty cycle/position, EGR error between actual and commanded, boost pressure, commanded/target boost pressure, PM filter inlet temperature, PM filter outlet temperature, exhaust gas temperature sensor output, variable geometry turbo position, corrected NOx sensor output, DEF dosing mode, stability of NOx sensor reading, engine friction – percent torque, commanded DEF dosing, DEF usage for current driving cycle, DEF dosing rate, charge air cooler outlet temperature, SCR intake temperature, SCR outlet temperature, modeled actual ammonia storage level on SCR, target ammonia storage level on SCR, NOx mass emission rate – engine out, NOx mass emission rate – tailpipe, Vehicle speed, Engine run time, and Hydrocarbon doser flow rate. Although more data stream values would enhance CARB staff's ability to better understand off-cycle emissions characteristics, these are the maximum number of data stream values that can be reasonably sampled given the current limitations of automotive computer processing ability and memory capacity.

The current OBD requirements are described in Chapter I, Section B.1.5 and HDIUT 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. The description of proposed HDIUT procedure amendments and amendments to require collection of OBD/REAL data are included in Chapter III, Section A.3.

Paragraph 2

Purpose
The purpose of this amendment is to create a new paragraph 2 requiring manufacturers to collect a complete scan of OBD data stream parameters (not just the 37 parameters identified above in paragraph 1 to this section), service mode data, and tracking data at scheduled times and events during all 3B-MAW evaluations for 2024 and subsequent model year engines in California.

Rationale
This amendment is necessary because the information proposed to be collected by the manufacturer is needed by CARB to better understand the off-cycle emissions characteristics of heavy-duty engines. A better understanding of emissions performance during off-cycle operation would lead to the development of more robust on-board diagnostics monitoring strategies and will be an effective metric assisting CARB's in-use compliance program identify unauthorized cycle beater activity more quickly than is currently possible under the existing off-board confirmatory process. The development of more robust on-board diagnostics would enable the detection of emissions-related malfunctions as they occur in-use affording the vehicle operator greater opportunity to affect emissions-related repairs in a timely manner, especially when the malfunction isn't adversely affecting vehicle performance.

The current OBD requirements are described in Chapter I, Section B.1.5 and HDIUT 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. The description of proposed HDIUT procedure amendments and amendments to require collection of OBD/REAL data are included in Chapter III, Section A.3.

Paragraph 3

Purpose
The purpose of this amendment is to create a new paragraph 3 requiring manufacturers to submit a test plan to CARB for preapproval at least 30 days prior to beginning 3B-MAW testing for 2024 and subsequent model year engines in California.

Rationale
This amendment is necessary to minimize delays in determining in-use compliance for an engine family because the manufacturer of that engine family did not comply with all the requirements necessary for a valid evaluation. Delays in determining non-compliant engine families reduces the effectiveness of CARB's heavy-duty in-use compliance program to take corrective action against high emitting engines, which results in higher emissions throughout the State. The requirement for CARB staff to preapprove test plans in advance will eliminate such delays.

The current HDIUT 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.

Paragraph 3.1

Purpose
The purpose of this amendment is to create a new subparagraph 3.1 identifying the minimum information that must be included in a manufacturer's test plan including

vehicle, engine, OBD/MIL, maintenance, and PEMS system data for 2024 and subsequent model year engines in California.

Rationale
This amendment is necessary because it provides manufacturers with a list of information that they must include in their test plan. The intent of this amendment is to minimize delays in determining in-use compliance for an engine family because the manufacturer of that engine family did not understand its obligation to comply with all the requirements necessary for a valid evaluation. Delays in determining non-compliant engine families reduces the effectiveness of CARB's heavy-duty in-use compliance program to take corrective action against high emitting engines, which results in higher emissions throughout the State. The requirement for CARB staff to preapprove test plans in advance would eliminate such delays.

The current HDIUT 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.

Paragraph 3.2

Purpose
The purpose of this amendment is to create a new subparagraph 3.2 informing the manufacturer to submit a test plan at least 30 calendar days in advance of testing to the new and unique email address hd-inuse@arb.ca.gov. The proposed amendment further requires that the manufacturer provide correct and up to date contact information for communications with CARB staff. Additionally, the amendment stipulates that CARB staff has 14 calendar days after submission of the manufacturer's test plan to provide feedback, or else the manufacturer may begin testing under the presumption that the submitted plan has been approved.

Rationale
This amendment is necessary to minimize delays in determining in-use compliance for an engine family by providing the manufacturer and CARB with a set period of time for developing and approving a valid test plan. Delays in determining non-compliant engine families reduce the effectiveness of CARB's heavy-duty in-use compliance program to take corrective action against high emitting engines, which results in higher emissions throughout the State. The requirement for CARB staff to preapprove test plans in advance would eliminate such delays.

The current HDIUT 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.

86.1925 What records must I keep?

A. Federal Provisions

Purpose
The purpose of this amendment is to update the date of incorporation for 40 CFR §86.1925 from June 14, 2005, to November 8, 2010.

Rationale
This amendment is necessary to ensure alignment to the greatest extent feasible with the federal requirements in 40 CFR §86.1925. Maintaining alignment when feasible allows manufacturers to conserve resources in not having to unnecessarily comply with duplicative requirements to certify an engine both federally and in California – resources that would be better used to more quickly comply with emission standards and in-use requirements.

Paragraph 1

Purpose
The purpose of this amendment is to create a new paragraph 1 to maintain alignment with the federal requirements in 40 CFR §86.1925(a) for which no change is required.

Rationale
This amendment is necessary for maintaining the direct incorporation of the federal requirements in 40 CFR §86.1925(a) while allowing CARB staff to propose amending other portions of 40 CFR §86.1925 that are currently incorporated without change.

Paragraph 2

Purpose
The purpose of this amendment is to create a new paragraph 2 requiring manufacturers to keep all records related to the in-use testing of an engine family for five years after the completion of testing for that family. The requirements in this paragraph 2 and its dependent subparagraphs 2.(1) and 2.(2), including dependent subparagraphs 2.(2)(i) through 2.(2)(iv), are substantively identical to the requirements in 40 CFR §86.1925(b) except that subparagraph 2.(2)(iv) requires manufacturers to retain records pertaining to the investigation of why an engine family failed the 3B-MAW in-use confirmation tests described in §86.1370.B.6 of these test procedures.

Rationale
This amendment is necessary for maintaining comprehensive record keeping requirements regardless of the methodology used for determining in-use compliance, i.e., NTE of 3B-MAW. The 3B-MAW approach, which would replace NTE beginning with 2024 model year heavy-duty engines and thereafter, is not currently addressed in the incorporated record keeping provision of 40 CFR §86.1925(b). The proposed

amendment to this paragraph 2, in particular to subparagraph 2.(2)(iv), ensures that manufacturers must keep records related to the investigation of 3B-MAW failures as is already required for investigations into NTE failures for five years. Such information would be useful in finding solutions to the problem that caused the in-use compliance failure and may be necessary for resolving disputes related to need for corrective action.

The current HDIUT 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.

Paragraph 3

Purpose
The purpose of this amendment is to create a new paragraph 3 to maintain alignment with the federal requirements in 40 CFR §86.1925(b)(3) for which no change is required.

Rationale
This amendment is necessary for maintaining the direct incorporation of the federal requirements in 40 CFR §86.1925(b)(3) while allowing CARB staff to propose amending other portions of 40 CFR §86.1925 that are currently incorporated without change.

Appendix I to Part 86 - Urban Dynamometer Schedules.

A. Federal Provisions.

Purpose
The first modification to this Appendix adds the term “Federal Provisions” to differentiate these provisions from California-specific provisions. This modification also updates the subparagraphs’ numbering.

Rationale
The term “Federal Provisions” is necessary to set forth the federal requirements. This would provide specificity to the regulated entities in accurately identifying the applicable dynamometer driving schedules federally.

B. California Provisions.

Purpose
New California provisions are added to specify the (LLC) engine dynamometer schedule for 2024 and subsequent model year medium- and heavy-duty diesel engines. The provisions specify second-by-second engine speed and torque profiles for heavy-duty engines.

Rationale
The addition of an engine dynamometer schedule is necessary to determine compliance with the LLC standards for 2024 and subsequent model year medium- and heavy-duty diesel engines.

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 the proposed amendment is to include 2022 and subsequent model year diesel hybrid powertrains optionally certified to certified criteria pollutants emissions standards pursuant to title 13, CCR §1956.8 into 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, diesel 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 the proposed amendment is to specify that Part 1036 applies with respect to exhaust emission standards for NMHC, CO, NOx, or PM for optionally certified diesel hybrid powertrains pursuant to title 13, CCR §1956.8.

Rationale
This amendment is necessary to have NMHC, CO, NOx, PM standards, which are considered criteria emission standards, to be applicable to diesel hybrid powertrain since this provision 1036.1.(b) states that engines/vehicles complying with Part 1036 does not have to comply with NMHC, CO, NOx, or PM standards, due to the focus of Part 1036 on GHG. Without this amendment, diesel hybrid powertrains optionally certified to criteria pollutants emissions standards 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 section is to describe the engines that are excluded from these requirements. The proposed amendment specifies that engines installed in an optionally certified diesel hybrid powertrains, whether the engines provide motive power or not, would be subject to the requirements of Part 1036 with respect to exhaust emission standards for NMHC, CO, NOx, or PM.

Rationale
This amendment is necessary to subject optionally certified diesel hybrid powertrains to the requirements of this Part. Without this amendment, a diesel engine that does not provide motive power, but otherwise is an integral and critical component in a properly functioning hybrid powertrain system, would not be subject to any requirements of this Part, but to other 40 CFR parts pertaining to auxiliary engines. Since optionally certified diesel hybrid powertrains would be certified as a system for heavy-duty on-road vehicle operation, the entire hybrid system, including the diesel engine, should be subject to the same certification requirements. If the diesel engines were excluded from the requirements of Part 1036, it would significantly reduce the effectiveness of the certified diesel hybrid powertrain system since the diesel 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
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 diesel hybrid powertrains when installed in a heavy-duty motor vehicle will constitute a violation of federal and state law.

Rationale
This amendment is necessary to ensure vehicle manufacturers follow the installation instructions for installing diesel hybrid powertrains into their vehicles. Proper installation of the diesel 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 diesel 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 diesel hybrid powertrains into the labeling requirements of this section.

Rationale
This amendment is necessary to require 2022 and subsequent model year diesel 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 diesel hybrid powertrains with heavy-duty diesel 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 diesel 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 diesel hybrid powertrain family would be certified to a single primary intended 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 diesel hybrid powertrain family and allow it to be installed in all vehicle service class. 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 diesel 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 diesel 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 diesel 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 diesel hybrid powertrains. Some of the required information includes 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 to optionally certified diesel hybrid powertrains.

Rationale
This amendment is necessary to ensure that diesel 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 diesel 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 diesel hybrid powertrains.

Rationale
This amendment is necessary to ensure that diesel hybrid powertrain manufacturers identify deterioration factors and provide information on how those deterioration factors were developed for diesel hybrid powertrains. This information is necessary for hybrid powertrain manufacturers to conduct the durability demonstration testing to ensure that their diesel 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 pollutants emissions. The proposed amendment requires diesel hybrid powertrains seeking to obtain certification to also 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 diesel 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 subsection that is currently placed on diesel engines. The proposed amendment includes optionally certified diesel hybrid powertrains in these provisions.

Rationale
This amendment is necessary to limit the scope of the certification to certain application(s) for which the diesel 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 diesel hybrid powertrains in these requirements.

Rationale
This amendment is necessary to ensure that diesel 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 diesel hybrid powertrains that fall outside the scope of the system that was tested and demonstrated during the certification process. This would ensure that the diesel hybrid powertrains built by the manufacturers are able to comply with all emission 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 diesel hybrid powertrains in these requirements.

Rationale
This amendment is necessary to allow CARB to provide a preliminary approval for the diesel 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 diesel hybrid powertrains in these requirements.

Rationale
This amendment is necessary to provide a process for manufacturers of diesel 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 diesel hybrid powertrains in these requirements.

Rationale
This amendment is necessary to provide guidance for manufacturers of diesel hybrid powertrains on the criteria needed for selecting diesel hybrid powertrain families that would be required in the application for certification. This amendment would help manufacturers decide what parameters to consider as well as how to select a diesel 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 diesel hybrid powertrains certifying to criteria pollutants emissions standards.

Rationale
This amendment is necessary in the introductory paragraph of this subsection to inform manufacturers of diesel hybrid powertrain that the testing requirements for certification that are currently set forth in this subsection as pertaining to engine family certification would 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 diesel 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 diesel hybrid powertrains in this testing.

Rationale
This amendment is necessary to provide enforcement capability for CARB to perform in-use testing on optionally certified diesel 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 diesel hybrid powertrain operates 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 diesel hybrid powertrains in these requirements.

Rationale
This amendment is necessary to inform manufacturers the required equipment to use and the procedures to follow to determine whether the diesel 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 diesel hybrid powertrains.

Rationale
This amendment is necessary to inform manufacturers of diesel 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 diesel hybrid powertrains when tested using the transient test cycle.

Rationale
This amendment is necessary to inform manufacturers of diesel 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 diesel 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 diesel 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 diesel hybrid powertrains.

Rationale
This amendment is necessary since the existing provisions of this Part only specify how to measure or calculate GHG emissions. As the amendment is to allow diesel 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.

Paragraph 8

Purpose
The purpose of this paragraph is to specify how to measure emissions of criteria pollutants for optionally certified diesel hybrid powertrains pursuant to title 13, CCR, § 1956.8, by testing the diesel hybrid powertrain on a dynamometer with the low-load cycle testing procedures to determine whether it meets the low-load emission standards.

Rationale

This amendment is necessary to enable diesel hybrid powertrains to be certified to the low-load emission standards by providing instructions and the vehicle low-load test cycle (Vehicle-LLC) for manufacturers to use in testing their diesel hybrid powertrain. Conventional diesel heavy-duty engines would also be required to be certified to the low-load emission standards using the low-load cycle. This amendment needs to be included for diesel hybrid powertrains to ensure consistency with similar 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.

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 diesel hybrid powertrains in 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 diesel 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.

1036.505 Ramped-modal testing procedures.

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 requirements of the ramped-modal testing procedure for engine testing and hybrid powertrain testing. The proposed amendment includes measurements of criteria pollutants emissions in the ramped-modal testing procedures of this section for diesel hybrid powertrains.

Rationale

This amendment is necessary since the existing provisions of this subsection only specify CO_2 emissions to be measured during the ramped-modal testing. As the amendment is to allow diesel hybrid powertrains to be tested to certify to criteria pollutants emissions standards, it is necessary to inform manufacturers of hybrid powertrains they need to also measure criteria pollutants emissions when conducting the ramped-modal testing for the diesel 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 3

Purpose
The purpose of this paragraph is to specify the default transmission efficiency and cycle parameter requirements for the ramped-modal testing procedure when testing without the transmission. The proposed amendment specifies cycle parameters for different vehicle weight classes in the ramped-modal testing procedures for optionally certified diesel hybrid powertrains, and adds the LLC test cycle to the existing FTP and RMC test cycles.

Rationale
This amendment is necessary to inform manufacturers of optionally certified diesel hybrid powertrains of the default transmission efficiency to use if the diesel hybrid powertrains are tested for certification without an actual transmission. This amendment is also necessary since the existing provisions of this subsection only specify the transient cycle parameters for the FTP and the highway cruise cycle parameters for the RMC during the ramped-modal testing, applicable to all vehicle weight classes. Heavy-duty vehicles in different weight class and duty cycles have different operating characteristics. The cycle parameters specified in the existing provision of this subsection are only valid for heavy heavy-duty vehicles and are not appropriate for light heavy-duty vehicle and medium heavy-duty vehicles. The U.S. EPA provides in Table 1 of § 1036.540 assigned transmission parameters for different vehicle service class and duty cycles, including distinct parameters for light heavy-duty vehicles and medium heavy-duty vehicles, apart from those for tractors and heavy heavy-duty vehicles. This amendment incorporates the cycle parameters provided in Table 1 of § 1036.540 to more accurately reflect the different operating characteristics of light heavy-duty vehicles and medium heavy-duty vehicles in the ramped modal testing procedures. In addition, the addition of the LLC to the existing test cycles by this amendment is necessary to allow diesel hybrid powertrains to be certified to the low-load emission 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.

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 section 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 describe warranty-related prohibitions. The proposed amendment applies these prohibitions to optionally certified diesel hybrid powertrains.

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 diesel hybrid powertrains to provide identical warranty-related prohibitions. 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 diesel hybrid powertrains in the definition.

Rationale
This amendment is necessary since the existing definition does not include optionally certified diesel hybrid powertrains to receive a Certificate of Conformity or Executive Order, which would not allow the diesel 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 diesel hybrid powertrains in the "Certification" definition.

Rationale
This amendment is necessary since the existing definition does not include optionally certified diesel hybrid powertrains in the "Certification" definition, relating to the process of obtaining an Executive Order to demonstrate that the diesel 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 diesel 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 diesel hybrid powertrain.

Rationale
This amendment is necessary to specifically describe a vehicle installed with a diesel 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 adds diesel 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, diesel 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

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.

Appendix to subpart F, section 1036.501 – Low-load cycle for optionally certified diesel hybrid powertrain families

B. California Provisions

Paragraph 1

Purpose
The purpose of paragraph 1 is to introduce the Vehicle-LLC cycle. This paragraph specifies the vehicle speed and road grade coefficients for the Vehicle-LLC cycle.

Rationale
This amendment is necessary to provide a low-load test cycle that manufacturers of optionally certified diesel hybrid powertrains could use to test their hybrid powertrains to applicable low-load emission standards. Without this amendment, diesel hybrid powertrains would not be able to certify to criteria pollutants emissions standards for the proposed low-load cycle. 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 F – Performing an Emission Test in the Laboratory

1065.514 Cycle-validation criteria for operation over specified 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.

1065.518 Engine preconditioning.

B. California provisions.

Paragraph 1

Purpose
The purpose of the amendments in paragraph 1 is to clarify that Executive Officer approval is needed to require CARB to use extra preconditioning cycles before valid emission tests and to outline the criteria the Executive Officer would use to approve such a request.

Rationale
Engine manufacturers may request the use of extra preconditioning cycles before valid emission tests can be conducted, but such requests must be reviewed and approved by CARB's Executive Officer to ensure the requests are technically necessary. Executive Officer approval would be granted upon determining that the request was made prior to certification, that the extra cycles are limited to the minimum technically necessary to ensure representative emission levels during the emission test, and that the emission levels during any extra cycles are accounted for in the engine manufacturer's determination of the applicable infrequent regeneration adjustment factors. These amendments would provide clarity to manufacturers as to what will be needed to support the request and ensure that manufacturers are aware that periods of higher or lower emission levels during extra cycles must still be considered in the determination of compliance with emission standards through the infrequent regeneration adjustment factor procedures in section 1065.680 of these test procedures.

Paragraph 2

Purpose
The purpose of the amendments in paragraph 2 is to clarify that preconditioning cycles and sequences carried out prior to valid emission tests must be designed to generate representative emission levels during the actual emission test and, therefore, cycles or sequences that cause the engine to emit at an unrepresentative level are prohibited. The amendment also clarifies that, regardless of previous operation, engines are required to be compliant with the emission standard after a single preconditioning cycle, unless additional cycles are requested and approved per paragraph 1 of this section.

Rationale
The amendments are necessary to ensure engine manufacturers are not mistakenly relying on preconditioning cycles or sequences to set the engine up to emit at unrepresentative levels during the ensuing emission test. The amendments also clarify a point of confusion some engine manufacturers had regarding minimum preconditioning before the engine should be designed to comply with the standards. Specifically, because the procedures state that CARB will run two preconditioning cycles before a valid emission test, some manufacturers mistakenly thought it was acceptable to design engines to emit at significantly higher emission levels before the completion of two preconditioning cycles. The amendments make it clear to engine manufacturers that engines are required to be designed to comply after a single preconditioning cycle, unless additional cycles are requested and approved. Likewise, the amendments clarify that, after the minimum preconditioning cycle(s) and before the next infrequent regeneration event, the engine must be designed to meet the applicable standards for any emission test run in that interval and designs that result in emission performance that degrades or otherwise deteriorates during successive replicate test cycles are not allowed.

Paragraph 3

Purpose
The purpose of paragraph 3 is to define the required preconditioning cycle for the LLC.

Rationale
Section 1065.518 of these test procedures identifies the required preconditioning cycles for the various emissions test cycles such as the FTP and RMC cycles. The proposed amendments introduce the new LLC certification test cycle. As such, the preconditioning requirements need to be specified for this cycle as well. This paragraph is added to describe the required preconditioning for the LLC as described in Chapter III, section A.1.1.1 of this Staff Report. The preconditioning cycle is described to be similar to the preconditioning cycle for the FTP test cycle.

Subpart G – Calculations and Data Requirements

1065.680 Adjusting emission levels to account for infrequently regenerating aftertreatment devices.

A. Federal Provisions

Purpose
The purpose of this amendment is to indicate alignment with the federal requirements in 40 CFR §1065.680 for which no change is required.

Rationale
This amendment is necessary for maintaining the direct incorporation of the federal requirements in 40 CFR §1065.680 while allowing CARB staff to propose amending other portions of 40 CFR §1065.680 that are currently incorporated without change.

B. California provisions.

Paragraph 1

Purpose
The purpose of the amendments in paragraph 1 is to clarify that adjustments for infrequent regeneration events are intended to capture and account for all emissions that occur both during such a regeneration event and between such events.

Rationale
Section 1065.680 of these test procedures details the procedures for engine manufacturers to develop infrequent regeneration adjustment factors (IRAFs) to account for temporary events that cause higher than normal emissions. The procedures require measurement of emissions during regeneration as well as during non-regeneration and determination of the frequency of such events to essentially calculate a true average emission level that is used to determine compliance with the emission standards at the time of certification. However, some manufacturers had mistakenly interpreted the procedures to allow them to utilize any single emission test between regenerations to determine the emission level for the non-regeneration portion of the IRAF regardless of the actual emission levels at earlier or later points in time between regenerations. The amendments clarify and provide examples to ensure that engine manufacturers are appropriately considering and accounting for all emissions that occur between regenerations to determine the non-regeneration emission level in the IRAF calculations. For example, if the engine were to temporarily exhibit higher emission levels after the completion of a regeneration event that were not accounted for as regeneration emission levels, the determination of the non-regeneration emission level must account for the magnitude and duration of such temporary elevated emissions relative to the complete period of operation between regenerations. Such amendments

are necessary to ensure the emission levels used for compliance to the standards are indeed representative of actual average emissions.

Subpart J - Field Testing and Portable Emission Measurement Systems

1065.935 Emission test sequence for field testing.

A. Federal Provisions

Purpose
The purpose of this amendment is to indicate alignment with the federal requirements in 40 CFR §1065.935 for which no change is required.

Rationale
This amendment is necessary for maintaining the direct incorporation of the federal requirements in 40 CFR §1065.935 while allowing CARB staff to propose amending other portions of 40 CFR §1065.935 that are currently incorporated without change.

B. California Provisions

Paragraph 1

Purpose
The purpose of this amendment is to create a new paragraph 1 addressing validity of new test intervals, i.e., 3B-MAWs. The new provisions replace the existing test intervals, NTE events, for in-use compliance and the manufacturer run in-use testing program beginning in 2024. The new language also provides guidance to determine emission results and compliance of the engine tested when new test intervals of the test engine do not meet the range criteria describe in 40 CFR §1065.550.

Rationale
This amendment is necessary because it provides more representative emissions data to be utilized to make a compliance determination during in-use compliance testing. The federal test procedures in 40 CFR §1065.905(g)(4) simply invalidate test intervals that do not meet the range criteria described in 40 CFR §1065.550. Consequently, emissions data higher than analyzer range of pollutants collected during the test intervals are not considered for compliance determination of the engine that emitted such high emissions during the in-use testing, which can make the compliance determination biased and non-representative. This is important for ensuring a more comprehensive and predictable evaluation of emissions performance.
Currently, emission measurements that occur outside the range of the instrumentation necessitate retesting at a higher range, which decreases the resolution of the measured data and also decreases the reliability of an accurate evaluation because the measurement accuracy tolerances become wider at higher ranges. For example, the tolerances at the desired range might be as tight as ± 0.001, but could become ± 0.01 at a higher range. The proposed amendment would require manufacturers, beginning for 2024 and subsequent model year engines, to estimate reasonable values for only the data points collected during a 3B-MAW evaluation that exceed the instrumentation range in a test interval while continuing to use the other data points as they were

measured. However, if 5 percent or more of the test intervals are out of range then the engine is considered to be non-compliant for the purpose of in-use testing unless the manufacturer can prove otherwise.

The current HDIUT 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.

Paragraph 2

Purpose
The purpose of this amendment is to create a new paragraph 2 addressing validity of the new 3B-MAW test intervals. The new language also provides guidance to determine emission results and compliance of the engine tested when new test intervals of the test engine do not meet the drift criteria describe in 40 CFR §1065.550.

Rationale
This amendment is necessary because it provides more representative emissions data to be utilized to make compliance determination during in-use compliance testing. The federal test procedures in 40 CFR §1065.905(g)(5) simply invalidate test intervals that do not meet the drift criteria described in 40 CFR §1065.550. The invalidation of such test intervals and consequent elimination of the emissions data collected during the test intervals could reduce the advantage of more representative 3B-MAW in-use compliance. Currently, manufacturers are required to compensate for drifted data in test intervals by establishing a relationship between a drifted measurement and a non-drifted measurement and by then applying the correction factors to the previously sampled data. However, the requirement is only applicable to data generated during an NTE evaluation. The proposed amendment would extend this requirement to data measured during a 3B-MAW evaluation for 2024 and subsequent model year heavy-duty engines. Additionally, the amendment stipulates that if 10 percent or more of the test intervals are subject to drift then the test must be invalidated unless the manufacturer can otherwise prove compliance using the drifted data.

The current HDIUT 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.

Subpart K – Definitions and Other Reference Information

1065.1001 Definitions.

A. Federal Provisions

Purpose
The purpose of this amendment is to indicate alignment with the federal requirements in 40 CFR §1065.1001 for which no change is required.

Rationale
This amendment is necessary for maintaining alignment with federal requirements in 40 CFR §1065.1001 apart from those specifically mentioned in the California Provisions for this section.

The current heavy-duty in-use test (HDIUT) 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 amending the definition of "Designated Compliance Officer" to reference appropriate CARB personnel instead of U.S. EPA personnel.

Rationale
This amendment is necessary to avoid any confusion with respect to the appropriate administrative authority oversight for California's heavy-duty in-use testing programs. As currently incorporated, the definition of Designated Compliance Officer still points to the Director of the U.S. EPA. This is a formality because these test procedures already contain a general stipulation that any reference to the Director of the U.S. EPA refers to the Executive Officer of CARB unless otherwise indicated. However, to avoid the possibility of confusion, this amendment proposes to specifically correct this instance in section 86.1001 of these test procedures to clearly recognize the Executive Officer of the Air Resources Board, or a designee of the Executive Officer, as the Designated Compliance Officer pertaining to California's in-use testing program.

The current heavy-duty in-use test (HDIUT) 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.

Paragraph 2

Purpose
The purpose of this amendment is to create a new paragraph 2 eliminating the inclusion of nonmethane nonethane (NMNEHC) hydrocarbons from the general definition for "Hydrocarbon" in §86.1001.

Rationale
This amendment is necessary because California does not agree that ethane should be subtracted from hydrocarbon when determining compliance with the hydrocarbon standard. Although minimally reactive in the atmosphere, ethane does have some global warming potential. Furthermore, the removal of ethane from the hydrocarbon standard would create a margin of compliance within the standard. Conceivably, manufacturers could take advantage of this compliance margin by calibrating their engines to produce more volatile organic compounds or toxics and still certify engines. CARB staff communicated these concerns to U.S. EPA during their rulemaking process, but U.S EPA chose to adopt the non-methane non-ethane standard regardless without providing a compelling counter argument to CARB staff's concerns.

The current heavy-duty in-use test (HDIUT) 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.

Paragraph 3

Purpose
The purpose of this amendment is to create a new paragraph 3 deleting the definition of "Nonmethane nonethane (NMNEHC) hydrocarbon" in §86.1001.

Rationale
As stated above in paragraph 2 to this section, this amendment is necessary because California does not agree that ethane should be subtracted from hydrocarbon when determining compliance with the hydrocarbon standard. Although minimally reactive in the atmosphere, ethane does have some global warming potential. Furthermore, the removal of ethane from the hydrocarbon standard would create a margin of compliance within the standard. Conceivably, manufacturers could take advantage of this compliance margin by calibrating their engines to produce more volatile organic compounds or toxics and still certify engines. CARB staff communicated these concerns to U.S. EPA during their GHG Phase 2 rulemaking process, but U.S EPA still chose to adopt the NMNEHC standard without providing a compelling counter argument to CARB staff's concerns.

The current heavy-duty in-use test (HDIUT) 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.

Paragraph 4

Purpose
The purpose of this amendment is to create a new paragraph 4 amending the definition of “Test interval” in §86.1001 for 2024 and subsequent model year heavy-duty engines subject to 3B-MAW in-use testing.

Rationale
This amendment is necessary to ensure applicability of the definition of a “Test interval” to California in-use testing when using the 3B-MAW method described in 86.1370.B.6 of these test procedures. Otherwise, the definition of a “Test interval” remains the same as the federal definition and the existing definition in these test procedures.

The current heavy-duty in-use test (HDIUT) 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.

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 judgment?

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.