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> Article 2 - Approval of Motor Vehicle Pollution Control Devices (New Vehicles)
> **Cal. Code Regs. Tit. 13, § 1961.3 - Greenhouse Gas Exhaust Emission Standards and Test Procedures-2017 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles**

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State Regulations Compare

Introduction. This section [1961.3](#) sets the greenhouse gas emission levels from new 2017 and subsequent model year passenger cars, light-duty trucks, and medium-duty passenger vehicles. Light-duty trucks from 3751 lbs. LVW - 8500 lbs. GVW that are certified to the Option 1 LEV II NOx Standard in section [1961\(a\)\(1\)](#) are exempt from these green-house gas emission requirements, however, passenger cars, light-duty trucks 0-3750 lbs. LVW, and medium-duty passenger vehicles are not eligible for this exemption.

Emergency vehicles may be excluded from these greenhouse gas emission requirements. The manufacturer must notify the Executive Officer that they are making such an election, in writing, prior to the start of the applicable model year or must comply with this section [1961.3](#).

(a) *Greenhouse Gas Emission Requirements.*

(1) *Fleet Average Carbon Dioxide Requirements for Passenger Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles.* For the purpose of determining compliance with this subsection (a)(1), the applicable fleet average CO₂ mass emission standards for each model year is the sales-weighted average of the calculated CO₂ exhaust mass emission target values for each manufacturer. For each model year, the sales-weighted fleet average CO₂ mass emissions value shall not exceed the sales-weighted average of the calculated CO₂ exhaust mass emission target values for that manufacturer.

(A) *Fleet Average Carbon Dioxide Target Values for Passenger Cars.* The fleet average CO₂ exhaust mass emission target values for passenger cars that are produced and delivered for sale in California each model year shall be determined as follows:

1. For passenger cars with a footprint of less than or equal to 41 square feet, the gram per mile CO₂ target value shall be selected for the appropriate model year from the following table:

| <i>Model Year</i> | <i>CO₂ Target Value (grams/mile)</i> |
|---------------------|---|
| 2017 | 195.0 |
| 2018 | 185.0 |
| 2019 | 175.0 |
| 2020 | 166.0 |
| 2021 | 157.0 |
| 2022 | 150.0 |
| 2023 | 143.0 |
| 2024 | 137.0 |
| 2025 and subsequent | 131.0 |

2. For passenger cars with a footprint of greater than 56 square feet, the gram per mile CO₂ target value shall be selected for the appropriate model year from the following table:

| <i>Model Year</i> | <i>CO₂ Target Value (grams/mile)</i> |
|---------------------|---|
| 2017 | 263.0 |
| 2018 | 250.0 |
| 2019 | 238.0 |
| 2020 | 226.0 |
| 2021 | 215.0 |
| 2022 | 205.0 |
| 2023 | 196.0 |
| 2024 | 188.0 |
| 2025 and subsequent | 179.0 |

3. For passenger cars with a footprint that is greater than 41 square feet and less than or equal to 56 square feet, the gram per mile CO₂ target value shall be calculated using the following equation and rounded to the nearest 0.1 grams/mile:

$$\text{Target gCO}_2/\text{mile} = [a \times f] + b$$

Where: *f* is the vehicle footprint and coefficients *a* and *b* are selected from the following table for the applicable model year.

| <i>Model Year</i> | <i>a</i> | <i>b</i> |
|-------------------|----------|----------|
| 2017 | 4.53 | 8.9 |

| | | |
|---------------------|------|------|
| 2018 | 4.35 | 6.5 |
| 2019 | 4.17 | 4.2 |
| 2020 | 4.01 | 1.9 |
| 2021 | 3.84 | -0.4 |
| 2022 | 3.69 | -1.1 |
| 2023 | 3.54 | -1.8 |
| 2024 | 3.4 | -2.5 |
| 2025 and subsequent | 3.26 | -3.2 |

(B) *Fleet Average Carbon Dioxide Target Values for Light-Duty Trucks and Medium-Duty Passenger Vehicles.* The fleet average CO₂ exhaust mass emission target values for light-duty trucks and medium-duty passenger vehicles that are produced and delivered for sale in California each model year shall be determined as follows:

1. For light-duty trucks and medium-duty passenger vehicles with a footprint of less than or equal to 41 square feet, the gram per mile CO₂ target value shall be selected from the following table:

| <i>Model Year</i> | <i>CO₂ Target Value (grams/mile)</i> |
|-------------------|---|
| 2017 | 238.0 |
| 2018 | 227.0 |
| 2019 | 220.0 |
| 2020 | 212.0 |
| 2021 | 195.0 |

| | |
|---------------------|-------|
| 2022 | 186.0 |
| 2023 | 176.0 |
| 2024 | 168.0 |
| 2025 and subsequent | 159.0 |

2. For light-duty trucks and medium-duty passenger vehicles with a footprint of greater than 41 square feet and less than or equal to the maximum footprint value specified in the table below for each model year, the gram/mile CO₂ target value shall be calculated using the following equation and rounded to the nearest 0.1 grams/mile:

$$\text{Target gCO}_2/\text{mile} = [a \times f] + b$$

Where: *f* is the vehicle footprint and coefficients *a* and *b* are selected from the following table for the applicable model year.

| <i>Model year</i> | <i>Maximum Footprint</i> | <i>a</i> | <i>b</i> |
|-------------------|--------------------------|----------|----------|
| 2017 | 50.7 | 4.87 | 38.3 |
| 2018 | 60.2 | 4.76 | 31.6 |
| 2019 | 66.4 | 4.68 | 27.7 |
| 2020 | 68.3 | 4.57 | 24.6 |
| 2021 | 73.5 | 4.28 | 19.8 |
| 2022 | 74.0 | 4.09 | 17.8 |
| 2023 | 74.0 | 3.91 | 16.0 |
| 2024 | 74.0 | 3.74 | 14.2 |

| | | | |
|---------------------|------|------|------|
| 2025 and subsequent | 74.0 | 3.58 | 12.5 |
|---------------------|------|------|------|

3. For light-duty trucks and medium-duty passenger vehicles with a footprint that is greater than the minimum footprint value specified in the table below and less than or equal to the maximum footprint value specified in the table below for each model year, the gram/mile CO₂ target value shall be calculated using the following equation and rounded to the nearest 0.1 grams/mile:

$$\text{Target gCO}_2/\text{mile} = [a \times f] + b$$

Where: *f* is the vehicle footprint and coefficients *a* and *b* are selected from the following table for the applicable model year.

| <i>Model year</i> | <i>Minimum Footprint</i> | <i>Maximum Footprint</i> | <i>a</i> | <i>b</i> |
|-------------------|--------------------------|--------------------------|----------|----------|
| 2017 | 50.7 | 66.0 | 4.04 | 80.5 |
| 2018 | 60.2 | 66.0 | 4.04 | 75.0 |

4. For light-duty trucks and medium-duty passenger vehicles with a footprint that is greater than the minimum value specified in the table below for each model year, the gram/mile CO₂ target value shall be selected for the applicable model year from the following table:

| <i>Model year</i> | <i>Minimum Footprint</i> | <i>CO₂ target value (grams/mile)</i> |
|-------------------|--------------------------|---|
| 2017 | 66.0 | 347.0 |
| 2018 | 66.0 | 342.0 |
| 2019 | 66.4 | 339.0 |
| 2020 | 68.3 | 337.0 |
| 2021 | 73.5 | 335.0 |

| | | |
|---------------------|------|-------|
| 2022 | 74.0 | 321.0 |
| 2023 | 74.0 | 306.0 |
| 2024 | 74.0 | 291.0 |
| 2025 and subsequent | 74.0 | 277.0 |

(C) *Calculation of Manufacturer-Specific Carbon Dioxide Fleet Average Standards.* For each model year, each manufacturer must comply with fleet average CO₂ standards for passenger cars and for light-duty trucks plus medium-duty passenger vehicles, as applicable, calculated for that model year as follows. For each model year, a manufacturer must calculate separate fleet average CO₂ values for its passenger car fleet and for its combined light-duty truck plus medium-duty passenger vehicle fleet using the CO₂ target values in subsection (a)(A). These calculated CO₂ values are the manufacturer-specific fleet average CO₂ standards for passenger cars and for light-duty trucks plus medium-duty passenger vehicles, as applicable, which apply for that model year.

1. A CO₂ target value shall be calculated in accordance with subparagraph (a)(1)(A) or (a)(1)(B), as applicable, for each unique combination of model type and footprint value.
2. Each CO₂ target value, determined for each unique combination of model type and footprint value, shall be multiplied by the total production of that model type/footprint combination for the applicable model year.
3. The resulting products shall be summed, and that sum shall be divided by the total production of passenger cars or total combined production of light-duty trucks and medium-duty passenger vehicles, as applicable, in that model year. The result shall be rounded to the nearest whole gram per mile. This result shall be the applicable fleet average CO₂ standard for the manufacturer's passenger car fleet or its combined light-duty truck and medium-duty passenger vehicle fleet, as applicable.

(2) *Nitrous Oxide (N₂O) and Methane (CH₄) Exhaust Emission Standards for Passenger Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles.* Each manufacturer's fleet of combined passenger automobile, light-duty trucks, and medium-duty passenger vehicles must comply with N₂O and CH₄ standards using either the provisions of subsection (a)(2)(A), subsection (a)(2)(B), or subsection (a)(2)(C). Except with prior approval of the Executive Officer, a manufacturer may not use the provisions of both subsection (a)(2)(A) and subsection (a)(2)(B) in the same model year. For example, a manufacturer may not use the provisions of subsection (a)(2)(A) for their passenger automobile fleet and the provisions of subsection (a)(2)(B) for their light-duty truck and medium-duty passenger vehicle fleet in the same model year. The manufacturer may use the provisions of both subsections (a)(2)(A) and (a)(2)(C) in the same model year. For example, a manufacturer may meet the N₂O standard in subsection (a)(2)(A)1 and an alternative CH₄ standard determined under subsection (a)(2)(C).

(A) Standards Applicable to Each Test Group.

1. Exhaust emissions of N₂O shall not exceed 0.010 grams per mile at full useful life, as measured on the FTP (40 CFR, Part 86 , Subpart B), as amended by the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light Duty Trucks, and Medium Duty Vehicles." Manufacturers may optionally determine an alternative N₂O standard under subsection (a)(2)(C).

2. Exhaust emissions of CH₄ shall not exceed 0.030 grams per mile at full useful life, as measured on the FTP (40 CFR, Part 86 , Subpart B), as amended by the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles." Manufacturers may optionally determine an alternative CH₄ standard under subsection (a)(2)(C).

(B) Including N₂O and CH₄ in Fleet Averaging Program. Manufacturers may elect to not meet the emission standards in subsection (a)(2)(A).

Manufacturers making this election shall measure N₂O and CH₄ emissions for each unique combination of model type and footprint value on both the FTP test cycle and the Highway Fuel Economy test cycle at full useful life, multiply the measured N₂O emissions value by 298 and the measured CH₄ emissions value by 25, and include both of these adjusted N₂O and CH₄ full useful life values in the fleet average calculations for passenger automobiles

and light-duty trucks plus medium-duty passenger vehicles, as calculated in accordance with subsection (a)(2)(A)(D).

(C) *Optional Use of Alternative N₂O and/or CH₄ Standards.* Manufacturers may select an alternative standard applicable to a test group, for either N₂O or CH₄, or both. For example, a manufacturer may choose to meet the N₂O standard in subsection (a)(2)(A)1 and an alternative CH₄ standard in lieu of the standard in subsection (a)(2)(A)2. The alternative standard for each pollutant must be less stringent than the applicable exhaust emission standard specified in subsection (a)(2)(A). Alternative N₂O and CH₄ standards apply to emissions as measured on the FTP (40 CFR, Part 86 , Subpart B), as amended by the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," for the full useful life, and become the applicable certification and in-use emission standard(s) for the test group. Manufacturers using an alternative standard for N₂O and/or CH₄ must calculate emission debits according to the provisions of subsection (a)(2)(D) for each test group/alternative standard combination. Debits must be included in the calculation of total credits or debits generated in a model year as required under subsection (b)(1)(B). Flexible fuel vehicles (or other vehicles certified for multiple fuels) must meet these alternative standards when tested on all applicable test fuel type.

(D) *CO₂-Equivalent Debits.* CO₂-equivalent debits for test groups using an alternative N₂O and/or CH₄ standard as determined under (a)(2)(C) shall be calculated according to the following equation and rounded to the nearest whole gram per mile:

$$\text{Debits} = \text{GWP} \times (\text{Production}) \times (\text{AltStd} - \text{Std})$$

Where:

Debits = N₂O or CH₄ CO₂-equivalent debits for a test group using an alternative N₂O or CH₄ standard;

GWP = 25 if calculating CH₄ debits and 298 if calculating N₂O debits;
 Production = The number of vehicles of that test group produced and delivered for sale in California;

AltStd = The alternative standard (N₂O or CH₄) selected by the manufacturer under (a)(2)(C); and

Std = The exhaust emission standard for N₂O or CH₄ specified in (a)(2)(A).

(3) *Alternative Fleet Average Standards for Manufacturers with Limited U.S. Sales.* Manufacturers meeting the criteria in this subsection (a)(3) may request that the Executive Officer establish alternative fleet average CO₂ standards that would apply instead of the standards in subsection (a)(1).

(A) *Eligibility for Alternative Standards.* Eligibility as determined in this subsection (a)(3) shall be based on the total sales of combined passenger cars, light-duty trucks, and medium-duty passenger vehicles. The terms "sales" and "sold" as used in this subsection (a)(3) shall mean vehicles produced and delivered for sale (or sold) in the states and territories of the United States. For the purpose of determining eligibility the sales of related companies shall be aggregated according to the provisions of section 1900. To be eligible for alternative standards established under this subsection (a) (3), the manufacturer's average sales for the three most recent consecutive model years must remain below 5,000. If a manufacturer's average sales for the three most recent consecutive model years exceeds 4,999, the manufacturer will no longer be eligible for exemption and must meet applicable emission standards as follows.

1. If a manufacturer's average sales for three consecutive model years exceeds 4,999, and if the increase in sales is the result of corporate acquisitions, mergers, or purchase by another manufacturer, the manufacturer shall comply with the emission standards described in subsections (a)(1) and (a)(2), as applicable, beginning with the first model year after the last year of the three consecutive model years.

2. If a manufacturer's average sales for three consecutive model years exceeds 4,999 and is less than 50,000, and if the increase in sales is solely the result of the manufacturer's expansion in vehicle production (not the result of corporate acquisitions, mergers, or purchase by another manufacturer), the manufacturer shall comply with the emission standards described in subsections (a)(1) and (a)(2), as applicable, beginning with the second model year after the last year of the three consecutive model years.

(B) *Requirements for New Entrants into the U.S. Market.* New entrants are those manufacturers without a prior record of automobile sales in the United States and without prior certification to (or exemption from, under 40 CFR § 86.1801-12(k)) greenhouse gas emission standards in 40 CFR § 86.1818-12 or greenhouse gas standards in section 1961.1. In addition to the

eligibility requirements stated in subsection (a)(3)(A), new entrants must meet the following requirements:

1. In addition to the information required under subsection (a)(3)(D), new entrants must provide documentation that shows a clear intent by the company to actually enter the U.S. market in the years for which alternative standards are requested. Demonstrating such intent could include providing documentation that shows the establishment of a U.S. dealer network, documentation of work underway to meet other U.S. requirements (e.g., safety standards), or other information that reasonably establishes intent to the satisfaction of the Executive Officer.
2. Sales of vehicles in the U.S. by new entrants must remain below 5,000 vehicles for the first two model years in the U.S. market and the average sales for any three consecutive years within the first five years of entering the U.S. market must remain below 5,000 vehicles. Vehicles sold in violation of these limits will be considered not covered by the certificate of conformity and the manufacturer will be subject to penalties on an individual-vehicle basis for sale of vehicles not covered by a certificate. In addition, violation of these limits will result in loss of eligibility for alternative standards until such point as the manufacturer demonstrates two consecutive model years of sales below 5,000 automobiles.
3. A manufacturer with sales in the most recent model year of less than 5,000 automobiles, but where prior model year sales were not less than 5,000 automobiles, is eligible to request alternative standards under subsection (a)(3). However, such a manufacturer will be considered a new entrant and subject to the provisions regarding new entrants in this subsection (a)(3), except that the requirement to demonstrate an intent to enter the U.S. market in subsection (a)(3)(B)(1) shall not apply.

(C) How to Request Alternative Fleet Average Standards. Eligible manufacturers may petition for alternative standards for up to five consecutive model years if sufficient information is available on which to base such standards.

1. To request alternative standards starting with the 2017 model year, eligible manufacturers must submit a completed application no later than July 30, 2013.
2. To request alternative standards starting with a model after 2017, eligible manufacturers must submit a completed application no later

than 36 months prior to the start of the first model year to which the alternative standards would apply.

3. The application must contain all the information required in subsection (a)(3)(D), and must be signed by a chief officer of the company. If the Executive Officer determines that the content of the request is incomplete or insufficient, the manufacturer will be notified and given an additional 30 days to amend the request.

4. A manufacturer may elect to petition for alternative standards under this subsection (a)(3)(C) by submitting to ARB a copy of the data and information submitted to EPA as required under 40 CFR § 86.1818-12(g), incorporated by reference in and amended by the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," and the EPA approval of the manufacturer's request for alternative fleet average standards for the 2017 through 2025 MY National Greenhouse Gas Program.

(D) *Data and Information Submittal Requirements.* Eligible manufacturers requesting alternative standards under subsection (a)(3) must submit the following information to the California Air Resources Board. The Executive Officer may request additional information as s/he deems appropriate. The completed request must be sent to the California Air Resources Board at the following address: Chief, Mobile Source Operations Division, California Air Resources Board, 9480 Telstar Avenue, Suite 4, El Monte, California 91731.

1. *Vehicle Model and Fleet Information.*

- a. The model years to which the requested alternative standards would apply, limited to five consecutive model years.
- b. Vehicle models and projections of production volumes for each model year.
- c. Detailed description of each model, including the vehicle type, vehicle mass, power, footprint, and expected pricing.
- d. The expected production cycle for each model, including new model introductions and redesign or refresh cycles.

2. *Technology Evaluation Information.*

- a. The CO₂ reduction technologies employed by the manufacturer on each vehicle model, including information regarding the cost and

CO₂-reducing effectiveness. Include technologies that improve air conditioning efficiency and reduce air conditioning system leakage, and any "off-cycle" technologies that potentially provide benefits outside the operation represented by the FTP and the HWFET.

b. An evaluation of comparable models from other manufacturers, including CO₂ results and air conditioning credits generated by the models. Comparable vehicles should be similar, but not necessarily identical, in the following respects: vehicle type, horsepower, mass, power-to-weight ratio, footprint, retail price, and any other relevant factors. For manufacturers requesting alternative standards starting with the 2017 model year, the analysis of comparable vehicles should include vehicles from the 2012 and 2013 model years, otherwise the analysis should at a minimum include vehicles from the most recent two model years.

c. A discussion of the CO₂-reducing technologies employed on vehicles offered outside of the U.S. market but not available in the U.S., including a discussion as to why those vehicles and/or technologies are not being used to achieve CO₂ reductions for vehicles in the U.S. market.

d. An evaluation, at a minimum, of the technologies projected by the California Air Resources Board in the "Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Public Hearing to Consider the "LEV III" Amendments to The California Greenhouse Gas and Criteria Pollutant Exhaust and Evaporative Emission Standards and Test Procedures and to the On-Board Diagnostic System Requirements for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles, and to the Evaporative Emission Requirements for Heavy-Duty Vehicles" and the appendices to this report, released on December 7, 2011, as those technologies likely to be used to meet greenhouse gas emission standards and the extent to which those technologies are employed or projected to be employed by the manufacturer. For any technology that is not projected to be fully employed, the manufacturer must explain why this is the case.

3. *Information Supporting Eligibility.*

a. U.S. sales for the three previous model years and projected sales for the model years for which the manufacturer is seeking alternative standards.

b. Information regarding ownership relationships with other manufacturers, including details regarding the application of the provisions of 40 CFR § 86.1838-01(b)(3) and section 1900 regarding the aggregation of sales of related companies.

(E) *Alternative Standards.* Upon receiving a complete application, the Executive Officer will review the application and determine whether an alternative standard is warranted. If the Executive Officer judges that an alternative standard is warranted, the following standards shall apply. For the purposes of this subsection (a)(3)(E), an "ultra-small volume manufacturer" shall mean a manufacturer that meets the requirements of subsection (a)(3).

1. At the beginning of the model year that is three model years prior to the model year for which an alternative standard is requested, each ultra-small volume manufacturer shall identify all vehicle models from the model year that is four model years prior to the model year for which an alternative standard is requested, certified by a large volume manufacturer that are comparable to that small volume manufacturer's vehicle models for the model year for which an alternative standard is requested, based on model type and footprint value. The ultra-small volume manufacturer shall demonstrate to the Executive Officer the appropriateness of each comparable vehicle model selected. Upon approval of the Executive Officer, s/he shall provide to the ultra-small volume manufacturer the target grams CO₂ per mile for each vehicle model type and footprint value that is approved. The ultra-small volume manufacturer shall calculate its fleet average CO₂ standard in accordance with subsection (a)(1)(C) based on these target grams CO₂ per mile values provided by the Executive Officer.

2. In the 2017 and subsequent model years, an ultra-small volume manufacturer shall either:

a. not exceed its fleet average CO₂ standard calculated in accordance with subsection (a)(1)(C) based on the target grams CO₂ per mile values provided by the Executive Officer; or

b. upon approval of the Executive Officer, if an ultra-small volume manufacturer demonstrates a vehicle model uses an engine, transmission, and emission control system and has a footprint value that are identical to a configuration certified for sale in California by a large volume manufacturer, those ultra-small volume

manufacturer vehicle models are exempt from meeting the requirements in paragraph 2.a of this subsection.

(F) *Restrictions on Credit Trading.* Manufacturers subject to alternative standards approved by the Executive Officer under this subsection (a)(3) may not trade credits to another manufacturer. Transfers of credits between a manufacturer's car and truck fleets are allowed.

(4) *Greenhouse Gas Emissions Values for Electric Vehicles, "Plug-In" Hybrid Electric Vehicles, and Fuel Cell Vehicles.*

(A) *Electric Vehicle Calculations.*

1. For each unique combination of model type and footprint value, a manufacturer shall calculate the City CO₂ Value using the following formula:

$$\text{City CO}_2 \text{ Value} = (270 \text{ gCO}_2\text{e/kWh}) * E_{\text{EV}} - 0.25 * \text{CO}_2 \text{ target}$$

Where E_{EV} is measured directly from each cycle for each test vehicle of battery electric vehicle technology in units of kilowatt-hours per mile (per SAE J1634, incorporated herein by reference).

2. For each unique combination of model type and footprint value, a manufacturer shall calculate the Highway CO₂ Value using the following formula:

$$\text{Highway CO}_2 \text{ Value} = (270 \text{ gCO}_2\text{e/kWh}) * E_{\text{EV}} - 0.25 * \text{CO}_2 \text{ target}$$

Where E_{EV} is measured directly from each cycle for each test vehicle of battery electric vehicle technology in units of kilowatt-hours per mile (per SAE J1634, incorporated herein by reference).

(B) *"Plug-In" Hybrid Electric Vehicle Calculations.* For each unique combination of model type and footprint value, a manufacturer shall calculate the City CO₂ Value and the Highway CO₂ Value using the following formulas:

$$\text{City CO}_2 \text{ Value} = \text{GHG}_{\text{urban}}$$

and

$$\text{Highway CO}_2 \text{ Value} = \text{GHG}_{\text{highway}}$$

Where $\text{GHG}_{\text{urban}}$ and $\text{GHG}_{\text{highway}}$ are measured in accordance with section G.12 of the "California Exhaust Emission Standards and Test Procedures for 2009 through 2017 Model Zero-Emission Vehicles and Hybrid Electric

Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes" or the "California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," as applicable.

(C) *Fuel Cell Vehicle Calculations.* For each unique combination of model type and footprint value, a manufacturer shall calculate the City CO₂ Value and the Highway CO₂ Value using the following formulas:

$$\text{City CO}_2 = \text{GHG}_{\text{FCV}} = (9132 \text{ gCO}_2\text{e/kg H}_2) * H_{\text{FCV}} - G_{\text{upstream}}$$

and

Highway CO₂ = GHG_{FCV} = (9132 gCO₂e/kg H₂) * H_{FCV} - G_{upstream} Where H_{FCV} means hydrogen consumption in kilograms of hydrogen per mile, measured for the applicable test cycle, in accordance with SAE J2572 (published October 2008), incorporated herein by reference.

(5) *Calculation of Fleet Average Carbon Dioxide Value.*

(A) For each unique combination of model type and footprint value, a manufacturer shall calculate a combined city/highway CO₂ exhaust emission value as follows:

$$0.55 \times \text{City CO}_2 \text{ Value} + 0.45 \times \text{Highway CO}_2 \text{ Value}$$

"City" CO₂ exhaust emissions shall be measured using the FTP test cycle (40 CFR, Part 86 , Subpart B), as amended by the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light Duty Trucks, and Medium Duty Vehicles." "Highway" CO₂ exhaust emission shall be measured using the using the Highway Fuel Economy Test (HWFET; 40 CFR 600 Subpart B).

(B) Each combined city/highway CO₂ exhaust emission, determined for each unique combination of model type and footprint value, shall be multiplied by the total production of that model type/footprint combination for the applicable model year.

(C) The resulting products shall be summed, and that sum shall be divided by the total production of passenger cars or total combined production of light-duty trucks and medium-duty passenger vehicles, as applicable, in that

model year. The result shall be rounded to the nearest whole gram per mile. This result shall be the manufacturer's actual sales-weighted fleet average CO₂ value for the manufacturer's passenger car fleet or its combined light-duty truck and medium-duty passenger vehicle fleet, as applicable.

(D) For each model year, a manufacturer must demonstrate compliance with the fleet average requirements in section (a)(1) based on one of two options applicable throughout the model year, either:

Option 1: the total number of passenger cars, light-duty trucks, and medium-duty passenger vehicles that are certified to the California exhaust emission standards in section 1961.3, and are produced and delivered for sale in California; or

Option 2: the total number of passenger cars, light-duty trucks, and medium-duty passenger vehicles that are certified to the California exhaust emission standards in this section 1961.3, and are produced and delivered for sale in California, the District of Columbia, and all states that have adopted California's greenhouse gas emission standards for that model year pursuant to Section 177 of the federal Clean Air Act (42 U.S.C. § 7507).

1. A manufacturer that selects compliance Option 2 must notify the Executive Officer of that selection, in writing, prior to the start of the applicable model year or must comply with Option 1. Once a manufacturer has selected compliance Option 2, that selection applies unless the manufacturer selects Option 1 and notifies the Executive Officer of that selection in writing before the start of the applicable model year.

2. When a manufacturer is demonstrating compliance using Option 2 for a given model year, the term "in California" as used in section 1961.3 means California, the District of Columbia, and all states that have adopted California's greenhouse gas emission standards for that model year pursuant to Section 177 of the federal Clean Air Act (42 U.S.C. § 7507).

3. A manufacturer that selects compliance Option 2 must provide to the Executive Officer separate values for the number of vehicles in each model type and footprint value produced and delivered for sale in the District of Columbia and for each individual state within the average and the City CO₂ Value and Highway CO₂ exhaust emission values that apply to each model type and footprint value.

(6) *Credits for Reduction of Air Conditioning Direct Emissions.* Manufacturers may generate A/C Direct Emissions Credits by implementing specific air conditioning system technologies designed to reduce air conditioning direct emissions over the useful life of their vehicles. A manufacturer may only use an A/C Direct Emissions Credit for vehicles within a model type upon approval of the A/C Direct Emissions Credit for that model type by the Executive Officer. The conditions and requirements for obtaining approval of an A/C Direct Emissions Credit are described in (A) through (F), below.

(A) Applications for approval of an A/C Direct Emissions Credit must be organized by model type. The applications must also include:

- * vehicle make and

- * number of vehicles within the model type that will be equipped with the air conditioning system to which the leakage credit shall apply.

Separate applications must be submitted for any two configurations of an A/C system with differences other than dimensional variation.

(B) To obtain approval of the A/C Direct Emissions Credit, the manufacturer must demonstrate through an engineering evaluation that the A/C system under consideration reduces A/C direct emissions. The demonstration must include all of the following elements:

- * the amount of A/C Direct Emissions Credit requested, in grams of CO₂-equivalent per mile (gCO₂e/mi);

- * the calculations identified in section (a)(6)(C) justifying that credit amount;

- * schematic of the A/C system;

- * specifications of the system components with sufficient detail to allow reproduction of the calculation; and

- * an explanation describing what efforts have been made to minimize the number of fittings and joints and to optimize the components in order to minimize leakage.

Calculated values must be carried to at least three significant figures throughout the calculations, and the final credit value must be rounded to one tenth of a gram of CO₂-equivalent per mile (gCO₂e/mi).

(C) The calculation of A/C Direct Emissions Credit depends on the refrigerant or type of system, and is specified in paragraphs 1, 2, and 3 of this

subsection.

1. HFC-134a vapor compression systems

For A/C systems that use HFC-134a refrigerant, the A/C Direct Emissions Credit is calculated using the following formula:

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Where:

Direct Credit Baseline = 12.6 gCO₂e/mi for passenger cars;

Direct Credit Baseline = 15.6 gCO₂e/mi for light-duty trucks and medium-duty passenger vehicles;

Avg LR = 16.6 grams/year for passenger cars;

Avg LR = 20.7 grams/year for light-duty trucks and medium-duty passenger vehicles;

LR = the larger of *SAE LR* or *Min LR*;

Where:

SAE LR = initial leak rate evaluated using SAE International's Surface Vehicle Standard SAE J2727 (Revised February 2012), incorporated by reference, herein;

Min LR = 8.3 grams/year for passenger car A/C systems with belt-driven compressors;

Min LR = 10.4 grams/year for light-duty truck and medium-duty passenger vehicle A/C systems with belt-driven compressors;

Min LR = 4.1 grams/year for passenger car A/C systems with electric compressors;

Min LR = 5.2 grams/year for light-duty truck and medium-duty passenger vehicle A/C systems with electric compressors.

Note: Initial leak rate is the rate of refrigerant leakage from a newly manufactured A/C system in grams of refrigerant per year. The Executive Officer may allow a manufacturer to use an updated version of SAE J2727 or an alternate method if s/he determines that the

updated SAE J2727 or the alternate method provides more accurate estimates of the initial leak rate of A/C systems than the February 2012 version of SAE J2727 does.

2. Low-GWP vapor compression systems

For A/C systems that use a refrigerant having a GWP of 150 or less, the A/C Direct Emissions Credit shall be calculated using the following formula:

$$\text{A/C Direct Credit} = \text{Low GWP Credit} - \text{High Leak Penalty}$$

Where:

[Click here to view image](#)

and

[Click here to view image](#)

Where:

Max Low GWP Credit = 13.8 gCO₂e/mi for passenger cars;

Max Low GWP Credit = 17.2 gCO₂e/mi for light-duty trucks and medium-duty passenger vehicles;

GWP = the global warming potential of the refrigerant over a 100-year horizon, as specified in section (a)(6)(F);

Max High Leak Penalty = 1.8 gCO₂e/mi for passenger cars;

Max High Leak Penalty = 2.1 gCO₂e/mi for light-duty trucks and medium-duty passenger vehicles;

Avg LR = 13.1 g/yr for passenger cars;

Avg LR = 16.6 g/yr for light-duty trucks and medium-duty passenger vehicles;

and where:

SAE LR = initial leak rate evaluated using SAE International's Surface Vehicle Standard SAE J2727 (Revised February 2012);

Min LR = 8.3 g/yr for passenger cars;

Min LR = 10.4 g/yr for light-duty trucks and medium-duty passenger vehicles.

Note: Initial leak rate is the rate of refrigerant leakage from a newly manufactured A/C system in grams of refrigerant per year. The Executive Officer may allow a manufacturer to use an updated version of SAE J2727 or an alternate applicable test method if s/he finds the update or the alternate method provides more accurate estimates of the initial leak rate of A/C systems than the February 2012 version of SAE J2727 does.

3. Other A/C systems

For an A/C system that uses a technology other than vapor compression cycles, an A/C Direct Emissions Credit may be approved by the Executive Officer. The amount of credit requested must be based on demonstration of the reduction of A/C direct emissions of the technology using an engineering evaluation that includes verifiable laboratory test data, and cannot exceed 13.8 gCO₂e/mi for passenger cars and 17.2 gCO₂e/mi for light-duty trucks and medium-duty passenger vehicles.

(D) The total leakage reduction credits generated by the air conditioning system shall be calculated separately for passenger cars, and for light-duty trucks and medium-duty passenger vehicles, according to the following formula:

$$\text{Total Credits (g/mi)} = \text{A/C Direct Credit} \times \text{Production}$$

Where:

A/C Direct Credit is calculated as specified in subsection (a)(6)(C).

Production = The total number of passenger cars or light-duty trucks plus medium-duty passenger vehicles, whichever is applicable, produced and delivered for sale in California, with the air conditioning system to which the *A/C Direct Credit* value from subsection (a)(6)(C) applies.

(E) The results of subsection (a)(6)(D), rounded to the nearest whole gram per mile, shall be included in the manufacturer's credit/debit totals calculated in subsection (b)(1)(B).

(F) The following values for refrigerant global warming potential (GWP), or alternative values as determined by the Executive Officer, shall be used in

the calculations of this subsection (a)(6). The Executive Officer shall determine values for refrigerants not included in this subsection (a)(6)(F) upon request by a manufacturer, based on findings by the Intergovernmental Panel on Climate Change (IPCC) or from other applicable research studies.

| <i>Refrigerant</i> | <i>GWP</i> |
|--------------------|------------|
| HFC-134a | 1,430 |
| HFC-152a | 124 |
| HFO-1234yf | 4 |
| CO ₂ | 1 |

(7) *Credits for Improving Air Conditioning System Efficiency.* Manufacturers may generate CO₂ credits by implementing specific air conditioning system technologies designed to reduce air conditioning-related CO₂ emissions over the useful life of their passenger cars, light-duty trucks, and/or medium-duty passenger vehicles. Credits shall be calculated according to this subsection (a)(7) for each air conditioning system that the manufacturer is using to generate CO₂ credits. The eligibility requirements specified in subsection (a)(7)(E) must be met before an air conditioning system is allowed to generate credits.

(A) Air conditioning efficiency credits are available for the following technologies in the gram per mile amounts indicated for each vehicle category in the following table:

| <i>Air Conditioning Technology</i> | <i>Passenger Cars (g/mi)</i> | <i>Light-Duty Trucks and Medium-Duty Passenger Vehicles (g/mi)</i> |
|------------------------------------|------------------------------|--|
| | | |

| | | |
|---|-----|-----|
| <p>Reduced reheat, with externally-controlled, variable-displacement compressor (<i>e.g.</i> a compressor that controls displacement based on temperature setpoint and/or cooling demand of the air conditioning system control settings inside the passenger compartment).</p> | 1.5 | 2.2 |
| <p>Reduced reheat, with externally-controlled, fixed-displacement or pneumatic variable displacement compressor (<i>e.g.</i> a compressor that controls displacement based on conditions within, or internal to, the air conditioning system, such as head pressure, suction pressure, or evaporator outlet temperature).</p> | 1.0 | 1.4 |
| <p>Default to recirculated air with closed-loop control of the air supply (sensor feedback to control interior air quality) whenever the ambient temperature is 75 °F or higher: Air conditioning systems that operated with closed-loop control of the air supply at different temperatures may receive credits by submitting an engineering analysis to the Administrator for approval.</p> | 1.5 | 2.2 |
| <p>Default to recirculated air with open-loop control air supply (no sensor feedback) whenever the ambient temperature is 75 °F or higher. Air conditioning systems that operate with open-loop control of the air supply at different temperatures may receive credits by submitting an engineering analysis to the Administrator for approval.</p> | 1.0 | 1.4 |

| | | |
|--|-----|-----|
| Blower motor controls which limit wasted electrical energy (e.g. pulse width modulated power controller). | 0.8 | 1.1 |
| Internal heat exchanger (e.g. a device that transfers heat from the high-pressure, liquid-phase refrigerant entering the evaporator to the low-pressure, gas-phase refrigerant exiting the evaporator). | 1.0 | 1.4 |
| Improved condensers and/or evaporators with system analysis on the component(s) indicating a coefficient of performance improvement for the system of greater than 10% when compared to previous industry standard designs). | 1.0 | 1.4 |
| Oil separator. The manufacturer must submit an engineering analysis demonstrating the increased improvement of the system relative to the baseline design, where the baseline component for comparison is the version which a manufacturer most recently had in production on the same vehicle design or in a similar or related vehicle model. The characteristics of the baseline component shall be compared to the new component to demonstrate the improvement. | 0.5 | 0.7 |

(B) Air conditioning efficiency credits are determined on an air conditioning system basis. For each air conditioning system that is eligible for a credit based on the use of one or more of the items listed in subsection (a)(7)(A), the total credit value is the sum of the gram per mile values listed in subsection (a)(7)(A) for each item that applies to the air conditioning system. However, the total credit value for an air conditioning system may not be greater than 5.0 grams per mile for any passenger car or 7.2 grams per mile for any light-duty truck or medium-duty passenger vehicle.

(C) The total efficiency credits generated by an air conditioning system shall be calculated separately for passenger cars and for light-duty trucks plus medium-duty passenger vehicles according to the following formula:

$$\text{Total Credits (g/mi)} = \text{Credit} \times \text{Production}$$

Where:

Credit = the CO₂ efficiency credit value in grams per mile determined in subsection (a)(7)(B) or (a)(7)(E), whichever is applicable.

Production = The total number of passenger cars or light-duty trucks plus medium-duty passenger vehicles, whichever is applicable, produced and delivered for sale in California, with the air conditioning system to which to the efficiency credit value from subsection (a)(7)(B) applies.

(D) The results of subsection (a)(7)(C), rounded to the nearest whole gram per mile, shall be included in the manufacturer's credit/debit totals calculated in subsection (b)(1)(B).

(E) For the purposes of this subsection (a)(7)(E), the AC17 Test Procedure shall mean the AC17 Air Conditioning Efficiency Test Procedure set forth in 40 CFR § 86.167-17, incorporated in and amended by the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles."

1. For each air conditioning system selected by the manufacturer to generate air conditioning efficiency credits, the manufacturer shall perform the AC17 Test Procedure.
2. Using good engineering judgment, the manufacturer must select the vehicle configuration to be tested that is expected to result in the greatest increased CO₂ emissions as a result of the operation of the air conditioning system for which efficiency credits are being sought. If the air conditioning system is being installed in passenger cars, light-duty trucks, and medium-duty passenger vehicles, a separate determination of the quantity of credits for passenger cars and for light-duty trucks and medium-duty passenger vehicles must be made, but only one test vehicle is required to represent the air conditioning system, provided it represents the worst-case impact of the system on CO₂ emissions.

3. For each air conditioning system selected by the manufacturer to generate air conditioning efficiency credits, the manufacturer shall perform the AC17 Test Procedure according to the following requirements. Each air conditioning system shall be tested as follows:

- a. Perform the AC17 test on a vehicle that incorporates the air conditioning system with the credit-generating technologies.
- b. Perform the AC17 test on a vehicle which does not incorporate the credit-generating technologies. The tested vehicle must be similar to the vehicle tested under subsection (a)(7)(E)(3)a.
- c. Subtract the CO₂ emissions determined from testing under subsection (a)(7)(E)(3)a from the CO₂ emissions determined from testing under subsection (a)(7)(E)(3)b and round to the nearest 0.1 grams/mile. If the result is less than or equal to zero, the air conditioning system is not eligible to generate credits. If the result is greater than or equal to the total of the gram per mile credits determined under subsection (a)(7)(B), then the air conditioning system is eligible to generate the maximum allowable value determined under subsection (a)(7)(B). If the result is greater than zero but less than the total of the gram per mile credits determined under subsection (a)(7)(B), then the air conditioning system is eligible to generate credits in the amount determined by subtracting the CO₂ emissions determined from testing under subsection (a)(7)(E)(3)a from the CO₂ emissions determined from testing under subsection (a)(7)(E)(3)b and rounding to the nearest 0.1 grams/mile.

4. For the first model year for which an air conditioning system is expected to generate credits, the manufacturer must select for testing the highest-selling subconfiguration within each vehicle platform that uses the air conditioning system. Credits may continue to be generated by the air conditioning system installed in a vehicle platform provided that:

- a. The air conditioning system components and/or control strategies do not change in any way that could be expected to cause a change in its efficiency;
- b. The vehicle platform does not change in design such that the changes could be expected to cause a change in the efficiency of the air conditioning system; and

c. The manufacturer continues to test at least one sub-configuration within each platform using the air conditioning system, in each model year, until all sub-configurations within each platform have been tested.

5. Each air conditioning system must be tested and must meet the testing criteria in order to be allowed to generate credits. Using good engineering judgment, in the first model year for which an air conditioning system is expected to generate credits, the manufacturer must select for testing the highest-selling subconfiguration within each vehicle platform using the air conditioning system. Credits may continue to be generated by an air conditioning system in subsequent model years if the manufacturer continues to test at least one sub-configuration within each platform on annually, as long as the air conditioning system and vehicle platform do not change substantially.

(8) *Off-Cycle Credits.* Manufacturers may generate credits for CO₂-reducing technologies where the CO₂ reduction benefit of the technology is not adequately captured on the FTP and/or the HWFET. These technologies must have a measurable, demonstrable, and verifiable real-world CO₂ reduction that occurs outside the conditions of the FTP and the HWFET. These optional credits are referred to as "off-cycle" credits. Off-cycle technologies used to generate emission credits are considered emission-related components subject to applicable requirements, and must be demonstrated to be effective for the full useful life of the vehicle. Unless the manufacturer demonstrates that the technology is not subject to in-use deterioration, the manufacturer must account for the deterioration in their analysis. The manufacturer must use one of the three options specified in this subsection (a)(8) to determine the CO₂ gram per mile credit applicable to an off-cycle technology. The manufacturer should notify the Executive Officer in its pre-model year report of its intention to generate any credits under this subsection (a)(8).

(A) *Credit available for certain off-cycle technologies.*

1. The manufacturer may generate a CO₂ gram/mile credit for certain technologies as specified in the following table, provided that each technology is applied to the minimum percentage of the manufacturer's total U.S. production of passenger cars, light-duty trucks, and medium-duty passenger vehicles specified in the table in each model year for which credit is claimed. Technology definitions are in subsection (e).

| <i>Off-Cycle Technology</i> | <i>Passenger Cars (g/mi)</i> | <i>Light-Duty Trucks and Medium-Duty Passenger Vehicles (g/mi)</i> | <i>Minimum Total Percent of U.S. Production</i> |
|-----------------------------------|------------------------------|--|---|
| Active aerodynamics | 0.6 | 1.0 | 10 |
| High efficiency exterior lighting | 1.1 | 1.1 | 10 |
| Engine heat recovery | 0.7 per 100W of capacity | 0.7 per 100W of capacity | 10 |
| Engine start-stop (idle-off) | 2.9 | 4.5 | 10 |
| Active transmission warm-up | 1.8 | 1.8 | 10 |
| Active engine warm-up | 1.8 | 1.8 | 10 |
| Electric heater circulation pump | 1.0 | 1.5 | n/a |
| Solar roof panels | 3.0 | 3.0 | n/a |
| Thermal control | [LESS THAN EQUAL TO]3.0 | [LESS THAN EQUAL TO]4.3 | n/a |

a. Credits may also be accrued for thermal control technologies as defined in subsection (e) in the amounts shown in the following table:

| <i>Thermal Control Technology</i> | <i>Credit Value: Passenger Cars (g/mi)</i> | <i>Credit Value: Light-Duty Trucks and Medium-Duty Passenger Vehicles (g/mi)</i> |
|-----------------------------------|--|--|
| Glass or glazing | [LESS THAN EQUAL TO]2.9 | [LESS THAN EQUAL TO]3.9 |
| Active seat ventilation | 1.0 | 1.3 |
| Solar reflective paint | 0.4 | 0.5 |
| Passive cabin ventilation | 1.7 | 2.3 |
| Active cabin ventilation | 2.1 | 2.8 |

b. The maximum credit allowed for thermal control technologies is limited to 3.0 g/mi for passenger cars and to 4.3 g/mi for light-duty trucks and medium-duty passenger vehicles. The maximum credit allowed for glass or glazing is limited to 2.9 g/mi for passenger cars and to 3.9 g/mi for light-duty trucks and medium-duty passenger vehicles.

c. Glass or glazing credits are calculated using the following equation:

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Where:

Credit = the total glass or glazing credits, in grams per mile, for a vehicle, which may not exceed 3.0 g/mi for passenger cars or 4.3 g/mi for light-duty trucks and medium-duty passenger vehicles;

$Z = 0.3$ for passenger cars and 0.4 for light-duty trucks and medium-duty passenger vehicles;

G_i = the measured glass area of window i , in square meters and rounded to the nearest tenth;

G = the total glass area of the vehicle, in square meters and rounded to the nearest tenth;

T_i = the estimated temperature reduction for the glass area of window i , determined using the following formula:

$$T_i = 0.3987 \times (Tts_{base} - Tts_{new})$$

Where:

Tts_{new} = the total solar transmittance of the glass, measured according to ISO 13837:2008, "Safety glazing materials -- Method for determination of solar transmittance" (incorporated by reference, herein).

Tts_{base} = 62 for the windshield, side-front, side-rear, rear-quarter, and backlite locations, and 40 for rooflite locations.

2. The maximum allowable decrease in the manufacturer's combined passenger car and light-duty truck plus medium-duty passenger vehicle fleet average CO₂ emissions attributable to use of the default credit values in subsection (a)(8)(A)1 is 10 grams per mile. If the total of the CO₂ g/mi credit values from the table in subsection (a)(8)(A)1 does not exceed 10 g/mi for any passenger automobile or light truck in a manufacturer's fleet, then the total off-cycle credits may be calculated according to subsection (a)(8)(D). If the total of the CO₂ g/mi credit values from the table in subsection (a)(8)(A)1 exceeds 10 g/mi for any passenger car, light-duty truck, or medium-duty passenger vehicle in a manufacturer's fleet, then the gram per mile decrease for the combined passenger car and light-duty truck plus medium-duty passenger vehicle fleet must be determined according to subsection (a)(8)(A)2.a to determine whether the 10 g/mi limitation has been exceeded.

a. Determine the gram per mile decrease for the combined passenger car and light-duty truck plus medium-duty passenger vehicle fleet using the following formula:

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Where:

Credits = The total of passenger car and light-duty truck plus medium-duty passenger vehicles credits, in Megagrams, determined according to subsection (a)(8)(D) and limited to those credits accrued by using the default gram per mile values in subsection (a)(8)(A)1.

$Prod_C$ = The number of passenger cars produced by the manufacturer and delivered for sale in the U.S.

$Prod_T$ = The number of light-duty trucks and medium-duty passenger vehicles produced by the manufacturer and delivered for sale in the U.S.

b. If the value determined in subsection (a)(8)(A)2.a is greater than 10 grams per mile, the total credits, in Megagrams, that may be accrued by a manufacturer using the default gram per mile values in subsection (a)(8)(A)1 shall be determined using the following formula:

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Where:

$Prod_C$ = The number of passenger cars produced by the manufacturer and delivered for sale in the U.S.

$Prod_T$ = The number of light-duty trucks and medium-duty passenger vehicles produced by the manufacturer and delivered for sale in the U.S.

c. If the value determined in subsection (a)(8)(A)2.a is not greater than 10 grams per mile, then the credits that may be accrued by a manufacturer using the default gram per mile values in subsection (a)(8)(A)1 do not exceed the allowable limit, and total credits may be determined for each category of vehicles according to subsection (a)(8)(D).

d. If the value determined in subsection (a)(8)(A)2.a is greater than 10 grams per mile, then the combined passenger car and light-duty truck plus medium-duty passenger vehicle credits, in Megagrams, that may be accrued using the calculations in subsection (a)(8)(D) must not exceed the value determined in subsection (a)(8)(A)2.b. This limitation should generally be done by reducing the amount of

credits attributable to the vehicle category that caused the limit to be exceeded such that the total value does not exceed the value determined in subsection (a)(8)(A)2.b.

3. In lieu of using the default gram per mile values specified in subsection (a)(8)(A)1 for specific technologies, a manufacturer may determine an alternative value for any of the specified technologies. An alternative value must be determined using one of the methods specified in subsection (a)(8)(B) or subsection (a)(8)(C).

(B) Technology demonstration using EPA 5-cycle methodology. To demonstrate an off-cycle technology and to determine a CO₂ credit using the EPA 5-cycle methodology, the manufacturer shall determine the off-cycle city/highway combined carbon-related exhaust emissions benefit by using the EPA 5-cycle methodology described in 40 CFR part 600. Testing shall be performed on a representative vehicle, selected using good engineering judgment, for each model type for which the credit is being demonstrated. The emission benefit of a technology is determined by testing both with and without the off-cycle technology operating. Multiple off-cycle technologies may be demonstrated on a test vehicle. The manufacturer shall conduct the following steps and submit all test data to the Executive Officer.

1. Testing without the off-cycle technology installed and/or operating. Determine carbon-related exhaust emissions over the FTP, the HWFET, the US06, the SC03, and the cold temperature FTP test procedures according to the test procedure provisions specified in 40 CFR part 600 subpart B and using the calculation procedures specified in § 600.113-08 of this chapter. Run each of these tests a minimum of three times without the off-cycle technology installed and operating and average the per phase (bag) results for each test procedure. Calculate the 5-cycle weighted city/highway combined carbon-related exhaust emissions from the averaged per phase results, where the 5-cycle city value is weighted 55% and the 5-cycle highway value is weighted 45%. The resulting combined city/highway value is the baseline 5-cycle carbon-related exhaust emission value for the vehicle.

2. Testing with the off-cycle technology installed and/or operating. Determine carbon-related exhaust emissions over the US06, the SC03, and the cold temperature FTP test procedures according to the test procedure provisions specified in 40 CFR part 600 subpart B and using the calculation procedures specified in 40 CFR § 600.113-08. Run each of these tests a minimum of three times with the off-cycle technology

installed and operating and average the per phase (bag) results for each test procedure. Calculate the 5-cycle weighted city/highway combined carbon-related exhaust emissions from the averaged per phase results, where the 5-cycle city value is weighted 55% and the 5-cycle highway value is weighted 45%. Use the averaged per phase results for the FTP and HWFET determined in subsection (a)(8)(B)1 for operation without the off-cycle technology in this calculation. The resulting combined city/highway value is the 5-cycle carbon-related exhaust emission value showing the off-cycle benefit of the technology but excluding any benefit of the technology on the FTP and HWFET.

3. Subtract the combined city/highway value determined in subsection (a)(8)(B)1 from the value determined in subsection (a)(8)(B)2. The result is the off-cycle benefit of the technology or technologies being evaluated. If this benefit is greater than or equal to three percent of the value determined in subsection (a)(8)(B)1 then the manufacturer may use this value, rounded to the nearest tenth of a gram per mile, to determine credits under subsection (a)(8)(C).

4. If the value calculated in subsection (a)(8)(B)3 is less than two percent of the value determined in subsection (a)(8)(B)1, then the manufacturer must repeat the testing required under subsections (a)(8)(B)1 and (a)(8)(B)2, except instead of running each test three times they shall run each test two additional times. The off-cycle benefit of the technology or technologies being evaluated shall be calculated as in subsection (a)(8)(B)3 using all the tests conducted under subsections (a)(8)(B)1, (a)(8)(B)2, and (a)(8)(B)4. If the value calculated in subsection (a)(8)(B)3 is less than two percent of the value determined in subsection (a)(8)(B)1, then the manufacturer must verify the emission reduction potential of the off-cycle technology or technologies using the EPA Vehicle Simulation Tool, and if the results support a credit value that is less than two percent of the value determined in subsection (a)(8)(B)1 then the manufacturer may use the off-cycle benefit of the technology or technologies calculated as in subsection (a)(8)(B)3 using all the tests conducted under subsections (a)(8)(B)1, (a)(8)(B)2, and (a)(8)(B)4, rounded to the nearest tenth of a gram per mile, to determine credits under subsection (a)(8)(C).

(C) Review and approval process for off-cycle credits.

1. Initial steps required.

a. A manufacturer requesting off-cycle credits under the provisions of subsection (a)(8)(B) must conduct the testing and/or simulation described in that paragraph.

b. A manufacturer requesting off-cycle credits under subsection (a)(8)(B) must conduct testing and/or prepare engineering analyses that demonstrate the in-use durability of the technology for the full useful life of the vehicle.

2. *Data and information requirements.* The manufacturer seeking off-cycle credits must submit an application for off-cycle credits determined under subsection (a)(8)(B). The application must contain the following:

a. A detailed description of the off-cycle technology and how it functions to reduce CO₂ emissions under conditions not represented on the FTP and HWFET.

b. A list of the vehicle model(s) which will be equipped with the technology.

c. A detailed description of the test vehicles selected and an engineering analysis that supports the selection of those vehicles for testing.

d. All testing and/or simulation data required under subsection (a)(8)(B), as applicable, plus any other data the manufacturer has considered in the analysis.

e. An estimate of the off-cycle benefit by vehicle model and the fleet-wide benefit based on projected sales of vehicle models equipped with the technology.

f. An engineering analysis and/or component durability testing data or whole vehicle testing data demonstrating the in-use durability of the off-cycle technology components.

3. *Review of the off-cycle credit application.* Upon receipt of an application from a manufacturer, the Executive Officer will do the following:

a. Review the application for completeness and notify the manufacturer within 30 days if additional information is required.

b. Review the data and information provided in the application to determine if the application supports the level of credits estimated by the manufacturer.

4. *Decision on off-cycle application.* The Executive Officer will notify the manufacturer in writing of its decision to approve or deny the application within 60 days of receiving a complete application, and if denied, the Executive Officer will provide the reasons for the denial.

(D) *Calculation of total off-cycle credits.* Total off-cycle credits in grams per mile of CO₂ (rounded to the nearest tenth of a gram per mile) shall be calculated separately for passenger cars and light-duty trucks plus medium-duty passenger vehicles according to the following formula:

Total Credits (g/mi) = Credit x Production

Where:

Credit = the credit value in grams per mile determined in subsection (a)(8)(A) or subsection (a)(8)(B).

Production = The total number of passenger cars or light-duty trucks plus medium-duty passenger vehicles, whichever is applicable, produced and delivered for sale in California, produced with the off-cycle technology to which to the credit value determined in subsection (a)(8)(A) or subsection (a)(8)(B) applies.

(9) *Credits for certain full-size pickup trucks.* Full-size pickup trucks may be eligible for additional credits based on the implementation of hybrid technologies or on exhaust emission performance, as described in this subsection (a)(9). Credits may be generated under either subsection (a)(9)(A) or subsection (a)(9)(B) for a qualifying pickup truck, but not both.

(A) *Credits for implementation of gasoline-electric hybrid technology.* Full-size pickup trucks that implement hybrid gasoline-electric technologies may be eligible for an additional credit under this subsection (a)(9)(A). Pickup trucks using the credits under this subsection (a)(9)(A) may not use the credits described in subsection (a)(9)(B).

1. Full-size pickup trucks that are mild hybrid gasoline-electric vehicles and that are produced in the 2017 through 2021 model years are eligible for a credit of 10 grams/mile. To receive this credit, the manufacturer must produce a quantity of mild hybrid full-size pickup trucks such that the proportion of production of such vehicles, when compared to the manufacturer's total production of full-size pickup trucks, is not less than the amount specified in the table below for each model year.

| <i>Model year</i> | <i>Required minimum percent of full-size pickup trucks</i> |
|-------------------|--|
| 2017 | 30% |
| 2018 | 40% |
| 2019 | 55% |
| 2020 | 70% |
| 2021 | 80% |

2. Full-size pickup trucks that are strong hybrid gasoline-electric vehicles and that are produced in the 2017 through 2025 model years are eligible for a credit of 20 grams/mile. To receive this credit, the manufacturer must produce a quantity of strong hybrid full-size pickup trucks such that the proportion of production of such vehicles, when compared to the manufacturer's total production of full-size pickup trucks, is not less than 10 percent for each model year.

(B) *Credits for emission reduction performance.* 2017 through 2021 model year full-size pickup trucks that achieve carbon-related exhaust emission values below the applicable target value determined in subsection (a)(1)(B) may be eligible for an additional credit. Pickup trucks using the credits under this subsection (a)(9)(B) may not use the credits described in subsection (a)(9)(A).

1. Full-size pickup trucks that achieve carbon-related exhaust emissions less than or equal to the applicable target value determined in subsection (a)(1)(B) multiplied by 0.85 (rounded to the nearest gram per mile) and greater than the applicable target value determined in subsection (a)(1)(B) multiplied by 0.80 (rounded to the nearest gram per mile) in a model year are eligible for a credit of 10 grams/mile. A pickup truck that qualifies for this credit in a model year may claim this credit for subsequent model years through the 2021 model year if the carbon-related exhaust emissions of that pickup truck do not increase relative to the emissions in the model year in which the pickup truck qualified for the credit. To qualify for this credit in each model year, the manufacturer must produce a quantity of full-size pickup trucks that

meet the emission requirements of this subsection (a)(9)(B)1 such that the proportion of production of such vehicles, when compared to the manufacturer's total production of full-size pickup trucks, is not less than the amount specified in the table below for each model year.

| <i>Model year</i> | <i>Required minimum percent of full-size pickup trucks</i> |
|-------------------|--|
| 2017 | 15% |
| 2018 | 20% |
| 2019 | 28% |
| 2020 | 35% |
| 2021 | 40% |

2. Full-size pickup trucks that achieve carbon-related exhaust emissions less than or equal to the applicable target value determined in subsection (a)(1)(B) multiplied by 0.80 (rounded to the nearest gram per mile) in a model year are eligible for a credit of 20 grams/mile. A pickup truck that qualifies for this credit in a model year may claim this credit for a maximum of five subsequent model years if the carbon-related exhaust emissions of that pickup truck do not increase relative to the emissions in the model year in which the pickup truck first qualified for the credit. This credit may not be claimed in any model year after 2025. To qualify for this credit, the manufacturer must produce a quantity of full-size pickup trucks that meet the emission requirements of subsection (a)(9)(B)1 such that the proportion of production of such vehicles, when compared to the manufacturer's total production of full-size pickup trucks, is not less than 10 percent in each model year.

(C) *Calculation of total full-size pickup truck credits.* Total credits in grams per mile of CO₂ (rounded to the nearest whole gram per mile) shall be calculated for qualifying full-size pickup trucks according to the following formula:

$$\text{Total Credits (g/mi)} = (10 \times \text{Production}_{10}) + (20 \times \text{Production}_{20})$$

Where:

Production₁₀ = The total number of full-size pickup trucks produced and delivered for sale in California with a credit value of 10 grams per mile from subsection (a)(9)(A) and subsection (a)(9)(B).

Production₂₀ = The total number of full-size pickup trucks produced and delivered for sale in California with a credit value of 20 grams per mile from subsection (a)(9)(A) and subsection (a)(9)(B).

(10) *Greenhouse Gas In-Use Compliance Standards.* The in-use exhaust CO₂ emission standard shall be the combined city/highway exhaust emission value calculated according to the provisions of subsection (a)(5)(A) for the vehicle model type and footprint value multiplied by 1.1 and rounded to the nearest whole gram per mile. For vehicles that are capable of operating on multiple fuels, a separate value shall be determined for each fuel that the vehicle is capable of operating on. These standards apply to in-use testing performed by the manufacturer pursuant to the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles."

(11) *Mid-Term Review of the 2022 through 2025 MY Standards.* The Executive Officer shall conduct a mid-term review to re-evaluate the state of vehicle technology to determine whether any adjustments to the stringency of the 2022 through 2025 model year standards are appropriate. California's mid-term review will be coordinated with its planned full participation in EPA's mid-term evaluation as set forth in 40 CFR § 86.1818-12(h).

(b) *Calculation of Greenhouse Gas Credits/Debits.* Credits that are earned as part of the 2012 through 2016 MY National greenhouse gas program shall not be applicable to California's greenhouse gas program. Debits that are earned as part of the 2012 through 2016 MY National greenhouse gas program shall not be applicable to California's greenhouse gas program.

(1) *Calculation of Greenhouse Gas Credits for Passenger Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles.*

(A) A manufacturer that achieves fleet average CO₂ values lower than the fleet average CO₂ requirement for the corresponding model year shall receive credits for each model year in units of g/mi. A manufacturer that achieves fleet average CO₂ values higher than the fleet average CO₂ requirement for the corresponding model year shall receive debits for each model year in units of g/mi. Manufacturers must calculate greenhouse gas

credits and greenhouse gas debits separately for passenger cars and for combined light-duty trucks and medium-duty passenger vehicles as follows:
$$\text{CO}_2 \text{ Credits or Debits} = (\text{CO}_2 \text{ Standard} - \text{Manufacturer's Fleet Average CO}_2 \text{ Value}) \times (\text{Total No. of Vehicles Produced and Delivered for Sale in California, Including ZEVs and HEVs}).$$

Where:

CO₂ Standard = the applicable standard for the model year as determined in subsection (a)(1)(C);

Manufacturer's Fleet Average CO₂ Value = average calculated according to subsection (a)(5);

(B) A manufacturer's total Greenhouse Gas credits or debits generated in a model year shall be the sum of its CO₂ credits or debits and any of the following credits or debits, if applicable. The manufacturer shall calculate, maintain, and report Greenhouse Gas credits or debits separately for its passenger car fleet and for its light-duty truck plus medium-duty passenger vehicle fleet.

1. Air conditioning leakage credits earned according to the provisions of subsection (a)(6);
2. Air conditioning efficiency credits earned according to the provisions of subsection (a)(7);
3. Off-cycle technology credits earned according to the provisions of subsection (a)(8).
4. CO₂-equivalent debits earned according to the provisions of subsection (a)(2)(D).

(2) A manufacturer with 2017 and subsequent model year fleet average Greenhouse Gas values greater than the fleet average CO₂ standard applicable for the corresponding model year shall receive debits in units of g/mi Greenhouse Gas equal to the amount of negative credits determined by the aforementioned equation. For the 2017 and subsequent model years, the total g/mi Greenhouse Gas credits or debits earned for passenger cars and for light-duty trucks and medium-duty passenger vehicles shall be summed together. The resulting amount shall constitute the g/mi Greenhouse Gas credits or debits accrued by the manufacturer for the model year.

(3) *Procedure for Offsetting Greenhouse Gas Debits.*

(A) A manufacturer shall equalize Greenhouse Gas emission debits by earning g/mi Greenhouse Gas emission credits in an amount equal to the g/mi Greenhouse Gas debits, or by submitting a commensurate amount of g/mi Greenhouse Gas credits to the Executive Officer that were earned previously or acquired from another manufacturer. A manufacturer shall equalize combined Greenhouse Gas debits for passenger cars, light-duty trucks, and medium-duty passenger vehicles within five model years after they are earned. If emission debits are not equalized within the specified time period, the manufacturer shall be subject to the Health and Safety Code section 43211 civil penalty applicable to a manufacturer which sells a new motor vehicle that does not meet the applicable emission standards adopted by the state board. The cause of action shall be deemed to accrue when the emission debits are not equalized by the end of the specified time period. For a manufacturer demonstrating compliance under Option 2 in subsection (a)(5)(D), the emission debits that are subject to a civil penalty under Health and Safety Code section 43211 shall be calculated separately for California, the District of Columbia, and each individual state that is included in the fleet average greenhouse gas requirements in subsection (a)(1). These emission debits shall be calculated for each individual state using the formula in subsections (b)(1) and (b)(2), except that the "Total No. of Vehicles Produced and Delivered for Sale in California, including ZEVs and HEVs" shall be calculated separately for the District of Columbia and each individual state.

For the purposes of Health and Safety Code section 43211, the number of passenger cars not meeting the state board's emission standards shall be determined by dividing the total amount of g/mi Greenhouse Gas emission debits for the model year calculated for California by the g/mi Greenhouse Gas fleet average requirement for passenger car applicable for the model year in which the debits were first incurred. For the purposes of Health and Safety Code section 43211, the number of light-duty trucks and medium-duty passenger vehicles not meeting the state board's emission standards shall be determined by dividing the total amount of g/mi Greenhouse Gas emission debits for the model year calculated for California by the g/mi Greenhouse Gas fleet average requirement for light-duty trucks and medium-duty passenger vehicles, applicable for the model year in which the debits were first incurred.

(B) Greenhouse Gas emission credits earned in the 2017 and subsequent model years shall retain full value through the fifth model year after they are

earned, and will have no value if not used by the beginning of the sixth model year after being earned.

(4) Use of Greenhouse Gas Emission Credits to Offset a Manufacturer's ZEV Obligations.

(A) For a given model year, a manufacturer that has Greenhouse Gas credits remaining after equalizing all of its Greenhouse Gas debits may use those Greenhouse Gas credits to comply with its ZEV obligations for that model year, in accordance with the provisions set forth in the "California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," incorporated by reference in section [1962.2](#).

(B) Any Greenhouse Gas credits used by a manufacturer to comply with its ZEV obligations shall retain no value for the purposes of complying with this section [1961.3](#).

(5) Credits and debits that are earned as part of the 2012 through 2016 MY National Greenhouse Gas Program, shall have no value for the purpose of complying with this section [1961.3](#).

(c) Optional Compliance with the 2017 through 2025 MY National Greenhouse Gas Program.

The optional compliance approach provided by this section [1961.3\(c\)](#) shall not be available for 2021 through 2025 model year passenger cars, light-duty trucks, and medium-duty passenger vehicles if the "2017 through 2025 MY National Greenhouse Gas Program" is altered via a final rule published in the *Federal Register* subsequent to October 25, 2016.

For the 2017 through 2025 model years, a manufacturer may elect to demonstrate compliance with this section [1961.3](#) by demonstrating compliance with the 2017 through 2025 MY National greenhouse gas program as follows:

(1) A manufacturer that selects compliance with this option must notify the Executive Officer of that selection, in writing, prior to the start of the applicable model year or must comply with [1961.3 \(a\) and \(b\)](#);

(2) The manufacturer must submit to ARB all data that it submits to EPA in accordance with the reporting requirements as required under [40 CFR § 86.1865-12](#), incorporated by reference in and amended by the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission

Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," for demonstrating compliance with the 2017 through 2025 MY National greenhouse gas program and the EPA determination of compliance. All such data must be submitted within 30 days of receipt of the EPA determination of compliance for each model year that a manufacturer selects compliance with this option;

(3) The manufacturer must provide to the Executive Officer separate values for the number of vehicles in each model type and footprint value produced and delivered for sale in California, the District of Columbia, and each individual state that has adopted California's greenhouse gas emission standards for that model year pursuant to Section 177 of the federal Clean Air Act (42 U.S.C. § 7507), the applicable fleet average CO₂ standards for each of these model types and footprint values, the calculated fleet average CO₂ value for each of these model types and footprint values, and all values used in calculating the fleet average CO₂ values.

(d) *Test Procedures.*

The certification requirements and test procedures for determining compliance with the emission standards in this section are set forth in the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," as amended September 9, 2021, incorporated by reference herein. In the case of hybrid electric vehicles, the certification requirements and test procedures for determining compliance with the emission standards in this section are set forth in the "California Exhaust Emission Standards and Test Procedures for 2009 through 2017 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," incorporated by reference in section 1962.1, or the "California Exhaust Emission Standards and Test Procedures for 2018 through 2025 Model Year Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," as amended August 25, 2022, incorporated by reference herein.

(e) *Abbreviations.* The following abbreviations are used in this section 1961.3:

"CFR" means Code of Federal Regulations.

"CH₄" means methane.

"CO₂" means carbon dioxide.

"FTP" means Federal Test Procedure.

"GHG" means greenhouse gas.

"g/mi" means grams per mile.

"GVW" means gross vehicle weight.

"GVWR" means gross vehicle weight rating.

"GWP" means the global warming potential.

"HEV" means hybrid-electric vehicle.

"HWFET" means Highway Fuel Economy Test (HWFET; 40 CFR [600](#) Subpart B).

"LDT" means light-duty truck.

"LVW" means loaded vehicle weight.

"MDPV" means medium-duty passenger vehicle.

"mg/mi" means milligrams per mile.

"MY" means model year.

"NHTSA" means National Highway Traffic Safety Administration.

"N₂O" means nitrous oxide.

"ZEV" means zero-emission vehicle.

(f) *Definitions Specific to this Section.* The following definitions apply to this section [1961.3](#):

- (1) "A/C Direct Emissions" means any refrigerant released from a motor vehicle's air conditioning system.
- (2) "Active Aerodynamic Improvements" means technologies that are activated only at certain speeds to improve aerodynamic efficiency by a minimum of three percent, while preserving other vehicle attributes or functions.
- (3) "Active Cabin Ventilation" means devices that mechanically move heated air from the cabin interior to the exterior of the vehicle.
- (4) "Active Transmission Warmup" means a system that uses waste heat from the exhaust system to warm the transmission fluid to an operating temperature range quickly using a heat exchanger in the exhaust system, increasing the

overall transmission efficiency by reducing parasitic losses associated with the transmission fluid, such as losses related to friction and fluid viscosity.

(5) "Active Engine Warmup" means a system using waste heat from the exhaust system to warm up targeted parts of the engine so that it reduces engine friction losses and enables the closed-loop fuel control to activate more quickly. It allows a faster transition from cold operation to warm operation, decreasing CO₂ emissions.

(6) "Active Seat Ventilation" means a device that draws air from the seating surface which is in contact with the occupant and exhausts it to a location away from the seat.

(7) "Blower motor controls which limit waste energy" means a method of controlling fan and blower speeds that does not use resistive elements to decrease the voltage supplied to the motor.

(8) "Default to recirculated air mode" means that the default position of the mechanism which controls the source of air supplied to the air conditioning system shall change from outside air to recirculated air when the operator or the automatic climate control system has engaged the air conditioning system (i.e., evaporator is removing heat), except under those conditions where dehumidification is required for visibility (i.e., defogger mode). In vehicles equipped with interior air quality sensors (e.g., humidity sensor, or carbon dioxide sensor), the controls may determine proper blend of air supply sources to maintain freshness of the cabin air and prevent fogging of windows while continuing to maximize the use of recirculated air. At any time, the vehicle operator may manually select the non-recirculated air setting during vehicle operation but the system must default to recirculated air mode on subsequent vehicle operations (i.e., next vehicle start). The climate control system may delay switching to recirculation mode until the interior air temperature is less than the outside air temperature, at which time the system must switch to recirculated air mode.

(9) "Electric Heater Circulation Pump" means a pump system installed in a stop-start equipped vehicle or in a hybrid electric vehicle or plug-in hybrid electric vehicle that continues to circulate hot coolant through the heater core when the engine is stopped during a stop-start event. This system must be calibrated to keep the engine off for 1 minute or more when the external ambient temperature is 30 deg F.

(10) "Emergency Vehicle" means a motor vehicle manufactured primarily for use as an ambulance or combination ambulance-hearse or for use by the United

States Government or a State or local government for law enforcement.

(11) "Engine Heat Recovery" means a system that captures heat that would otherwise be lost through the exhaust system or through the radiator and converting that heat to electrical energy that is used to meet the electrical requirements of the vehicle. Such a system must have a capacity of at least 100W to achieve 0.7 g/mi of credit. Every additional 100W of capacity will result in an additional 0.7 g/mi of credit.

(12) "Engine Start-Stop" means a technology which enables a vehicle to automatically turn off the engine when the vehicle comes to a rest and restart the engine when the driver applies pressure to the accelerator or releases the brake.

(13) "EPA Vehicle Simulation Tool" means the "EPA Vehicle Simulation Tool" as incorporated by reference in 40 CFR § [86.1](#) in the Notice of Proposed Rulemaking for EPA's 2017 and subsequent MY National Greenhouse Gas Program, as proposed at 76 Fed. Reg. [74854](#), [75357](#) (December 1, 2011).

(14) "Executive Officer" means the Executive Officer of the California Air Resources Board.

(15) "Footprint" means the product of average track width (rounded to the nearest tenth of an inch) and wheelbase (measured in inches and rounded to the nearest tenth of an inch), divided by 144 and then rounded to the nearest tenth of a square foot, where the average track width is the average of the front and rear track widths, where each is measured in inches and rounded to the nearest tenth of an inch.

(16) "Federal Test Procedure" or "FTP" means 40 CFR, Part [86](#) , Subpart B, as amended by the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles."

(17) "Full-size pickup truck" means a light-duty truck that has a passenger compartment and an open cargo box and which meets the following specifications:

1. A minimum cargo bed width between the wheelhouses of 48 inches, measured as the minimum lateral distance between the limiting interferences (pass-through) of the wheelhouses. The measurement shall exclude the transitional arc, local protrusions, and depressions or pockets, if present. An open cargo box means a vehicle where the cargo box does not

have a permanent roof or cover. Vehicles produced with detachable covers are considered "open" for the purposes of these criteria.

2. A minimum open cargo box length of 60 inches, where the length is defined by the lesser of the pickup bed length at the top of the body and the pickup bed length at the floor, where the length at the top of the body is defined as the longitudinal distance from the inside front of the pickup bed to the inside of the closed endgate as measured at the height of the top of the open pickup bed along vehicle centerline, and the length at the floor is defined as the longitudinal distance from the inside front of the pickup bed to the inside of the closed endgate as measured at the cargo floor surface along vehicle centerline.

3. A minimum towing capability of 5,000 pounds, where minimum towing capability is determined by subtracting the gross vehicle weight rating from the gross combined weight rating, or a minimum payload capability of 1,700 pounds, where minimum payload capability is determined by subtracting the curb weight from the gross vehicle weight rating.

(18) "Greenhouse Gas" means the following gases: carbon dioxide, methane, nitrous oxide, and hydrofluorocarbons.

(19) "GWP" means the global warming potential of the refrigerant over a 100-year horizon, as specified in Intergovernmental Panel on Climate Change (IPCC) 2007: Climate Change 2007 -- The Physical Science Basis. S. Solomon et al. (editors), Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK and New York, NY, USA, ISBN 0-521-70596-7, or determined by ARB if such information is not available in the IPCC Fourth Assessment Report.

(20) "High Efficiency Exterior Lighting" means a lighting technology that, when installed on the vehicle, is expected to reduce the total electrical demand of the exterior lighting system by a minimum of 60 watts when compared to conventional lighting systems. To be eligible for this credit the high efficiency lighting must be installed in the following components: parking/position, front and rear turn signals, front and rear side markers, stop/brake lights (including the center-mounted location), taillights, backup/reverse lights, and license plate lighting.

(21) "Improved condensers and/or evaporators" means that the coefficient of performance (COP) of air conditioning system using improved evaporator and condenser designs is 10 percent higher, as determined using the bench test procedures described in SAE J2765 "Procedure for Measuring System COP of a

Mobile Air Conditioning System on a Test Bench," when compared to a system using standard, or prior model year, component designs. SAE J2765 is incorporated by reference herein. The manufacturer must submit an engineering analysis demonstrating the increased improvement of the system relative to the baseline design, where the baseline component(s) for comparison is the version which a manufacturer most recently had in production on the same vehicle design or in a similar or related vehicle model. The dimensional characteristics (e.g., tube configuration/thickness/spacing, and fin density) of the baseline component(s) shall be compared to the new component(s) to demonstrate the improvement in coefficient of performance.

(22) "Mild hybrid gasoline-electric vehicle" means a vehicle that has start/stop capability and regenerative braking capability, where the recaptured braking energy over the FTP is at least 15 percent but less than 75 percent of the total braking energy, where the percent of recaptured braking energy is measured and calculated according to 40 CFR § 600.108(g).

(23) "Model Type" means a unique combination of car line, basic engine, and transmission class.

(24) "2012 through 2016 MY National Greenhouse Gas Program" means the national program that applies to new 2012 through 2016 model year passenger cars, light-duty-trucks, and medium-duty passenger vehicles as adopted by the U.S. Environmental Protection Agency on April 1, 2010 (75 Fed. Reg. [25324](#), [25677](#) (May 7, 2010)).

(25) "2017 through 2025 MY National Greenhouse Gas Program" means the national program that applies to new 2017 through 2025 model year passenger cars, light-duty-trucks, and medium-duty passenger vehicles as adopted by the U.S. Environmental Protection Agency as codified in 40 CFR Part [86](#), Subpart S, except as follows: For model years 2021 through 2025, the "2017 through 2025 MY National Greenhouse Gas Program" means the national program that applies to new 2021 through 2025 model year passenger cars, light-duty-trucks, and medium-duty passenger vehicles as adopted by the U.S. Environmental Protection Agency as codified in 40 CFR Part [86](#), Subpart S, as last amended on October 25, 2016 that incorporates CFR sections 86.1818-12 (October 25, 2016), 86.1865-12 (October 25, 2016), 86.1866-12 (October 25, 2016), 86.1867-12 (October 25, 2016), 86.1868-12 (October 25, 2016), 86.1869-12 (October 25, 2016), 86.1870-12 (October 25, 2016), and 86.1871-12 (October 25, 2016).

(26) "Oil separator" means a mechanism that removes at least 50 percent of the oil entrained in the oil/refrigerant mixture exiting the compressor and returns it

to the compressor housing or compressor inlet, or a compressor design that does not rely on the circulation of an oil/refrigerant mixture for lubrication.

(27) "Passive Cabin Ventilation" means ducts or devices which utilize convective airflow to move heated air from the cabin interior to the exterior of the vehicle.

(28) "Plug-in Hybrid Electric Vehicle" means "off-vehicle charge capable hybrid electric vehicle" as defined in the "California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes."

(29) "Reduced reheat, with externally controlled, fixed-displacement or pneumatic variable displacement compressor" means a system in which the output of either compressor is controlled by cycling the compressor clutch off-and-on via an electronic signal, based on input from sensors (e.g., position or setpoint of interior temperature control, interior temperature, evaporator outlet air temperature, or refrigerant temperature) and air temperature at the outlet of the evaporator can be controlled to a level at 41°F, or higher.

(30) "Reduced reheat, with externally-controlled, variable displacement compressor" means a system in which compressor displacement is controlled via an electronic signal, based on input from sensors (e.g., position or setpoint of interior temperature control, interior temperature, evaporator outlet air temperature, or refrigerant temperature) and air temperature at the outlet of the evaporator can be controlled to a level at 41°F, or higher.

(31) "SC03" means the SC03 test cycle as set forth in the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light Duty Trucks, and Medium Duty Vehicles."

(32) "Solar Reflective Paint" means a vehicle paint or surface coating which reflects at least 65 percent of the impinging infrared solar energy, as determined using ASTM standards E903-96 (Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres, DOI: 10.1520/E0903-96 (Withdrawn 2005)), E1918-06 (Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field, DOI: 10.1520/E1918-06), or C1549-09 (Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer, DOI: 10.1520/C1549-09). These ASTM standards are incorporated by reference, herein.

(33) "Solar Roof Panels" means the installation of solar panels on an electric vehicle or a plug-in hybrid electric vehicle such that the solar energy is used to provide energy to the electric drive system of the vehicle by charging the battery or directly providing power to the electric motor with the equivalent of at least 50 Watts of rated electricity output.

(34) "Strong hybrid gasoline-electric vehicle" means a vehicle that has start/stop capability and regenerative braking capability, where the recaptured braking energy over the Federal Test Procedure is at least 75 percent of the total braking energy, where the percent of recaptured braking energy is measured and calculated according to 40 CFR § 600.108(g).

(35) "Subconfiguration" means a unique combination within a vehicle configuration of equivalent test weight, road load horsepower, and any other operational characteristics or parameters which is accepted by USEPA.

(36) "US06" means the US06 test cycle as set forth in the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light Duty Trucks, and Medium Duty Vehicles."

(37) "Worst-Case" means the vehicle configuration within each test group that is expected to have the highest CO₂-equivalent value, as calculated in section (a)(5).

(g) Severability. Each provision of this section is severable, and in the event that any provision of this section is held to be invalid, the remainder of both this section and this article remains in full force and effect.

Notes

Cal. Code Regs. Tit. 13, § 1961.3

Note: Authority cited: Sections 38550, 38566, 39500, 39600, 39601, 43013, 43018, 43018.5, 43101, 43104 and 43105, Health and Safety Code. Reference: Sections 39002, 39003, 39667, 43000, 43009.5, 43013, 43018, 43018.5, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106 and 43211, Health and Safety Code.

1. New section filed 8-8-2012; operative 8-8-2012 pursuant to Government Code section 11343.4 (Register 2012, No. 32).

2. New subsection (a)(3)(C)4., amendment of subsections (a)(6)(C)1.-2 and (a)(7)(E), new subsection (a)(11), amendment of subsection (b)(4)(A), new subsections (c)-(c)(3), subsection relettering, amendment of newly designated subsections (f)(13) and (f)(17)1.-2., new subsection (f)(25) and subsection renumbering filed 12-31-2012; operative 12-31-2012