

Environmental Protection Agency

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each applicable vehicle produced by that manufacturer.

(viii) If EPA or the manufacturer determines that a reporting error occurred on an annual report previously submitted to EPA, the manufacturer's credit or debit calculations will be recalculated. EPA may void erroneous credits, unless traded, and will adjust erroneous debits. In the case of traded erroneous credits, EPA must adjust the selling manufacturer's credit balance to reflect the sale of such credits and any resulting credit deficit.

(3) *Notice of opportunity for hearing.* Any voiding of the certificate under paragraph (1)(vi) of this section will be made only after EPA has offered the affected manufacturer an opportunity for a hearing conducted in accordance with § 86.614–84 for light-duty vehicles or § 86.1014–84 for light-duty trucks and, if a manufacturer requests such a hearing, will be made only after an initial decision by the Presiding Officer.

[75 FR 25691, May 7, 2010, as amended at 76 FR 19874, Apr. 8, 2011; 76 FR 39522, July 6, 2011; 76 FR 57379, Sept. 15, 2011]

§ 86.1866–12 CO₂ fleet average credit programs.

(a) *Incentive for certification of advanced technology vehicles.* Electric vehicles, plug-in hybrid electric vehicles, and fuel cell vehicles, as those terms are defined in § 86.1803–01, that are certified and produced in the 2012 through 2016 model years may be eligible for a reduced CO₂ emission value under the provisions of this paragraph (a) and under the provisions of part 600 of this chapter.

(1) Electric vehicles, fuel cell vehicles, and plug-in hybrid electric vehicles may use a value of zero (0) grams/mile of CO₂ to represent the proportion of electric operation of a vehicle that is derived from electricity that is generated from sources that are not on-board the vehicle.

(2) The use of zero (0) grams/mile CO₂ is limited to the first 200,000 combined electric vehicles, plug-in hybrid electric vehicles, and fuel cell vehicles produced and delivered for sale by a manufacturer in the 2012 through 2016 model years, except that a manufacturer that produces and delivers for sale 25,000 or more such vehicles in the 2012 model year shall be subject to a limitation on the use of zero (0) grams/mile CO₂ to the first 300,000 combined electric vehicles, plug-in hybrid electric vehicles, and fuel cell vehicles produced and delivered for sale by a manufacturer in the 2012 through 2016 model years.

(b) *Credits for reduction of air conditioning refrigerant leakage.* Manufacturers may generate credits applicable to the CO₂ fleet average program described in § 86.1865–12 by implementing specific air conditioning system technologies designed to reduce air conditioning refrigerant leakage over the useful life of their passenger cars and/or light trucks. Credits shall be calculated according to this paragraph (b) for each air conditioning system that the manufacturer is using to generate CO₂ credits. Manufacturers may also generate early air conditioning refrigerant leakage credits under this paragraph (b) for the 2009 through 2011 model years according to the provisions of § 86.1867–12(b).

(1) The manufacturer shall calculate an annual rate of refrigerant leakage from an air conditioning system in grams per year according to the provisions of § 86.166–12.

(2) The CO₂-equivalent gram per mile leakage reduction to be used to calculate the total credits generated by the air conditioning system shall be determined according to the following formulae, rounded to the nearest tenth of a gram per mile:

(i) Passenger automobiles:

$$\text{Leakage Credit} = \text{MaxCredit} \times \left[1 - \left(\frac{\text{Leakage}}{16.6} \right) \times \left(\frac{\text{GWP}_{REF}}{\text{GWP}_{HFC134a}} \right) \right]$$

Where:

MaxCredit is 12.6 (grams CO₂-equivalent/mile) for air conditioning systems using

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HFC-134a, and 13.8 (grams CO₂-equivalent/mile) for air conditioning systems using a refrigerant with a lower global warming potential.

Leakage means the annual refrigerant leakage rate determined according to the provisions of §86.166-12(a), except if the calculated rate is less than 8.3 grams/year (4.1 grams/year for systems using only electric compressors), the rate for the purpose of this formula shall be 8.3 grams/year (4.1 grams/year for systems using only electric compressors).

The constant 16.6 is the average passenger car impact of air conditioning leakage in units of grams/year.

GWP_{REF} means the global warming potential of the refrigerant as indicated in paragraph (b)(5) of this section or as otherwise determined by the Administrator.

GWP_{HFC134a} means the global warming potential of HFC-134a as indicated in paragraph (b)(5) of this section or as otherwise determined by the Administrator.

(ii) Light trucks:

$$\text{Leakage Credit} = \text{MaxCredit} \times \left[1 - \left(\frac{\text{Leakage}}{20.7} \right) \times \left(\frac{\text{GWP}_{\text{REF}}}{\text{GWP}_{\text{HFC134a}}} \right) \right]$$

Where:

MaxCredit is 15.6 (grams CO₂-equivalent/mile) for air conditioning systems using HFC-134a, and 17.2 (grams CO₂-equivalent/mile) for air conditioning systems using a refrigerant with a lower global warming potential.

Leakage means the annual refrigerant leakage rate determined according to the provisions of §86.166-12(a), except if the calculated rate is less than 10.4 grams/year (5.2 grams/year for systems using only electric compressors), the rate for the purpose of this formula shall be 10.4 grams/year (5.2 grams/year for systems using only electric compressors).

The constant 20.7 is the average light truck impact of air conditioning leakage in units of grams/year.

GWP_{REF} means the global warming potential of the refrigerant as indicated in paragraph (b)(5) of this section or as otherwise determined by the Administrator.

GWP_{R134a} means the global warming potential of HFC-134a as indicated in paragraph (b)(5) of this section or as otherwise determined by the Administrator.

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

$$\text{Total Credits (megagrams)} = (\text{Leakage} \times \text{Production} \times \text{VLM}) \div 1,000,000$$

Where:

Leakage = the CO₂-equivalent leakage credit value in grams per mile determined in paragraph (b)(2) of this section.

Production = The total number of passenger cars or light trucks, whichever is applicable, produced with the air conditioning system to which to the leakage credit

value from paragraph (b)(2) of this section applies.

VLM = vehicle lifetime miles, which for passenger cars shall be 195,264 and for light trucks shall be 225,865.

(4) The results of paragraph (b)(3) of this section, rounded to the nearest whole number, shall be included in the manufacturer's credit/debit totals calculated in §86.1865-12(k)(5).

(5) The following values for refrigerant global warming potential (GWP_{REF}), or alternative values as determined by the Administrator, shall be used in the calculations of this paragraph (b). The Administrator will determine values for refrigerants not included in this paragraph (b)(5) upon request by a manufacturer.

- (i) For HFC-134a, GWP_{REF} = 1430;
- (ii) For HFC-152a, GWP_{REF} = 124;
- (iii) For HFO-1234yf, GWP_{REF} = 4;
- (iv) For CO₂, GWP_{REF} = 1.

(c) *Credits for improving air conditioning system efficiency.* Manufacturers may generate credits applicable to the CO₂ fleet average program described in §86.1865-12 by implementing specific air conditioning system technologies designed to reduce air conditioning-related CO₂ emissions over the useful life of their passenger cars and/or light trucks. Credits shall be calculated according to this paragraph (c) for each air conditioning system that the manufacturer is using to generate CO₂ credits. Manufacturers may also generate early air conditioning efficiency credits under this paragraph (c) for the 2009 through 2011 model years according to

the provisions of § 86.1867-12(b). For model years 2012 and 2013 the manufacturer may determine air conditioning efficiency credits using the requirements in paragraphs (c)(1) through (4) of this section. For model years 2014 and later the eligibility requirements specified in paragraph (c)(5) of this section must be met before an air conditioning system is allowed to generate credits.

(1) Air conditioning efficiency credits are available for the following technologies in the gram per mile amounts indicated:

(i) Reduced reheat, with externally-controlled, variable-displacement compressor (*e.g.* a compressor that controls displacement based on temperature setpoint and/or cooling demand of the air conditioning system control settings inside the passenger compartment): 1.7 g/mi.

(ii) Reduced reheat, with externally-controlled, fixed-displacement or pneumatic variable displacement compressor (*e.g.* 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): 1.1 g/mi.

(iii) 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: 1.7 g/mi. 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.

(iv) Default to recirculated air with open-loop control air supply (no sensor feedback) whenever the ambient temperature is 75 °F or higher: 1.1 g/mi. 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.

(v) Blower motor controls which limit wasted electrical energy (*e.g.* pulse width modulated power controller): 0.9 g/mi.

(vi) 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): 1.1 g/mi.

(vii) 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): 1.1 g/mi.

(viii) Oil separator: 0.6 g/mi. 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.

(2) 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 paragraph (c)(1) of this section, the total credit value is the sum of the gram per mile values listed in paragraph (c)(1) of this section for each item that applies to the air conditioning system. If the sum of those values for an air conditioning system is greater than 5.7 grams per mile, the total credit value is deemed to be 5.7 grams per mile.

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

$$\text{Total Credits (Megagrams)} = (\text{Credit} \times \text{Production} \times \text{VLM}) \div 1,000,000$$

Where:

Credit = the CO₂ efficiency credit value in grams per mile determined in paragraph (c)(2) or (c)(5) of this section, whichever is applicable.

Production = The total number of passenger cars or light trucks, whichever is applicable, produced with the air conditioning system to which to the efficiency credit value from paragraph (c)(2) of this section applies.

VLM = vehicle lifetime miles, which for passenger cars shall be 195,264 and for light trucks shall be 225,865.

(4) The results of paragraph (c)(3) of this section, rounded to the nearest whole number, shall be included in the manufacturer's credit/debit totals calculated in § 86.1865–12(k)(5).

(5) Use of the Air Conditioning Idle Test Procedure is required after the 2013 model year as specified in this paragraph (c)(5).

(i) After the 2013 model year, for each air conditioning system selected by the manufacturer to generate air conditioning efficiency credits, the manufacturer shall perform the Air Conditioning Idle Test Procedure specified in § 86.165–14 of this part.

(ii) 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 automobiles and light trucks, a separate determination of the quantity of credits for passenger automobiles and

light trucks 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.

(iii) For an air conditioning system to be eligible to generate credits in the 2014 and later model years, the increased CO₂ emissions as a result of the operation of that air conditioning system determined according to the Idle Test Procedure in § 86.165–14 must be less than 21.3 grams per minute.

(A) If the increased CO₂ emissions determined from the Idle Test Procedure in § 86.165–14 is less than or equal to 14.9 grams/minute, the total credit value for use in paragraph (c)(3) of this section shall be as determined in paragraph (c)(2) of this section.

(B) If the increased CO₂ emissions determined from the Idle Test Procedure in § 86.165–14 is greater than 14.9 grams/minute and less than 21.3 grams/minute, the total credit value for use in paragraph (c)(3) of this section shall be as determined according to the following formula:

$$TCV = TCV_1 \times \left[1 - \left(\frac{ITP - 14.9}{6.4} \right) \right]$$

Where:

TCV = The total credit value for use in paragraph (c)(3) of this section;

TCV₁ = The total credit value determined according to paragraph (c)(2) of this section; and

ITP = the increased CO₂ emissions determined from the Idle Test Procedure in § 86.165–14.

(iv) Air conditioning systems with compressors that are powered solely by electricity shall submit Air Conditioning Idle Test Procedure data to be eligible to generate credits in 2014 and later model years, but such systems are not required to meet a specific threshold to be eligible to generate such credits, as long as the engine is off for at least 2 cumulative minutes during the air conditioning-on portion of the Idle Test Procedure in § 86.165–12(d).

(6) The following definitions apply to this paragraph (c):

(i) *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.

(ii) *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.

(iii) *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.

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

(v) *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; see § 86.1. 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.

(vi) *Oil separator* means a mechanism which 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 which does not rely on the circulation of an oil/refrigerant mixture for lubrication.

(d) *Credits for CO₂-reducing technologies where the CO₂ reduction is not captured on the Federal Test Procedure or the Highway Fuel Economy Test.* With prior EPA approval, manufacturers may optionally generate credits applicable to the CO₂ fleet average program described in § 86.1865-12 by implementing innovative technologies that have a measurable, demonstrable, and verifiable real-world CO₂ reduction. These optional credits are referred to as "off-cycle" credits and may be earned through the 2016 model year.

(1) *Qualification criteria.* To qualify for this credit, the following criteria must be met as determined by the Administrator:

(i) The technology must be an innovative and novel vehicle- or engine-based approach to reducing greenhouse gas emissions, and not in widespread use.

(ii) The CO₂-reducing impact of the technology must not be significantly measurable over the Federal Test Procedure and the Highway Fuel Economy Test. The technology must improve CO₂ emissions beyond the driving conditions of those tests.

(iii) The technology must be able to 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.

(2) *Quantifying the CO₂ reductions of an off-cycle technology.* The manufacturer may use one of the two options specified in this paragraph (d)(2) to measure the CO₂-reducing potential of an innovative off-cycle technology. The option described in paragraph (d)(2)(ii) of this section may be used only with EPA approval, and to use that option the manufacturer must be able to justify to the Administrator why the 5-cycle option described in paragraph (d)(2)(i) of this section insufficiently characterizes the effectiveness of the off-cycle technology. The manufacturer should notify EPA in their pre-model year report of their intention to generate any credits under paragraph (d) of this section.

(i) *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 5-cycle city/highway combined carbon-related exhaust emissions both with the technology installed and operating and without the technology installed and/or operating. The manufacturer shall conduct the following steps, both with the off-cycle technology installed and operating and without the technology operating or installed.

(A) Determine carbon-related exhaust emissions over the FTP, the HFET, 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.

(B) Calculate 5-cycle city and highway carbon-related exhaust emissions using data determined in paragraph (d)(2)(i)(A) of this section according to the calculation procedures in paragraphs (d) through (f) of §600.114-08 of this chapter.

(C) Calculate a 5-cycle city/highway combined carbon-related exhaust emission value using the city and highway values determined in paragraph (d)(2)(i)(B) of this section.

(D) Subtract the 5-cycle city/highway combined carbon-related exhaust emis-

sion value determined with the off-cycle technology operating from the 5-cycle city/highway combined carbon-related exhaust emission value determined with the off-cycle technology not operating. The result is the gram per mile credit amount assigned to the technology.

(ii) *Technology demonstration using alternative EPA-approved methodology.* In cases where the EPA 5-cycle methodology described in paragraph (d)(2)(i) of this section cannot adequately measure the emission reduction attributable to an innovative off-cycle technology, the manufacturer may develop an alternative approach. Prior to a model year in which a manufacturer intends to seek these credits, the manufacturer must submit a detailed analytical plan to EPA. EPA will work with the manufacturer to ensure that an analytical plan will result in appropriate data for the purposes of generating these credits. The alternative demonstration program must be approved in advance by the Administrator and should:

(A) Use modeling, on-road testing, on-road data collection, or other approved analytical or engineering methods;

(B) Be robust, verifiable, and capable of demonstrating the real-world emissions benefit with strong statistical significance;

(C) Result in a demonstration of baseline and controlled emissions over a wide range of driving conditions and number of vehicles such that issues of data uncertainty are minimized;

(D) Result in data on a model type basis unless the manufacturer demonstrates that another basis is appropriate and adequate.

(iii) *Calculation of total off-cycle credits.* Total off-cycle credits in Megagrams of CO₂ (rounded to the nearest whole number) shall be calculated separately for passenger automobiles and light trucks according to the following formula:

$$\text{Total Credits (Megagrams)} = (\text{Credit} \times \text{Production} \times \text{VLM}) \div 1,000,000$$

Where:

Credit = the 5-cycle credit value in grams per mile determined in paragraph (d)(2)(i)(D) or (d)(2)(ii) of this section.

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Production = The total number of passenger cars or light trucks, whichever is applicable, produced with the off-cycle technology to which the credit value determined in paragraph (d)(2)(i)(D) or (d)(2)(ii) of this section applies.

VLM = vehicle lifetime miles, which for passenger cars shall be 195,264 and for light trucks shall be 225,865.

(3) *Notice and opportunity for public comment.* The Administrator will publish a notice of availability in the FEDERAL REGISTER notifying the public of a manufacturer's proposed alternative off-cycle credit calculation methodology. The notice will include details regarding the proposed methodology, but will not include any Confidential Business Information. The notice will include instructions on how to comment on the methodology. The Administrator will take public comments into consideration in the final determination, and will notify the public of the final determination. Credits may not be accrued using an approved methodology until the model year following the final approval.

[75 FR 25695, May 7, 2010, as amended at 76 FR 39522, July 6, 2011]

§ 86.1867-12 Optional early CO₂ credit programs.

Manufacturers may optionally generate CO₂ credits in the 2009 through 2011 model years for use in the 2012 and later model years subject to EPA approval and to the provisions of this section. Manufacturers may generate early fleet average credits, air conditioning leakage credits, air conditioning efficiency credits, early advanced technology credits, and early off-cycle technology credits. Manufacturers generating any credits under this section must submit an early credits report to the Administrator as required in this section. The terms "sales" and "sold" as used in this section shall mean vehicles produced and delivered for sale in the states and territories of the United States.

(a) *Early fleet average CO₂ reduction credits.* Manufacturers may optionally generate credits for reductions in their fleet average CO₂ emissions achieved in the 2009 through 2011 model years. To generate early fleet average CO₂ reduction credits, manufacturers must select

one of the four pathways described in paragraphs (a)(1) through (4) of this section. The manufacturer may select only one pathway, and that pathway must remain in effect for the 2009 through 2011 model years. Fleet average credits (or debits) must be calculated and reported to EPA for each model year under each selected pathway. Early credits are subject to five year carry-forward restrictions based on the model year in which the credits are generated.

(1) *Pathway 1.* To earn credits under this pathway, the manufacturer shall calculate an average carbon-related exhaust emission value to the nearest one gram per mile for the classes of motor vehicles identified in this paragraph (a)(1), and the results of such calculations will be reported to the Administrator for use in determining compliance with the applicable CO₂ early credit threshold values.

(i) An average carbon-related exhaust emission value calculation will be made for the combined LDV/LDT1 averaging set, where the terms LDV and LDT1 are as defined in § 86.1803.

(ii) An average carbon-related exhaust emission value calculation will be made for the combined LDT2/HLDT/MDPV averaging set, where the terms LDT2, HLDT, and MDPV are as defined in § 86.1803.

(iii) Average carbon-related exhaust emission values shall be determined according to the provisions of § 600.510-12 of this chapter, except that:

(A) [Reserved]

(B) The average carbon-related exhaust emissions for alcohol fueled model types shall be calculated according to the provisions of § 600.510-12(j)(2)(ii)(B) of this chapter, without the use of the 0.15 multiplicative factor.

(C) The average carbon-related exhaust emissions for natural gas fueled model types shall be calculated according to the provisions of § 600.510-12(j)(2)(iii)(B) of this chapter, without the use of the 0.15 multiplicative factor.

(D) The average carbon-related exhaust emissions for alcohol dual fueled model types shall be the value measured using gasoline or diesel fuel, as