

535.6 Measurement and calculation procedures.

535.7 Averaging, banking, and trading (ABT) program.

535.8 Reporting requirements.

535.9 Enforcement approach.

AUTHORITY: 49 U.S.C. 32902; delegation of authority at 49 CFR 1.50.

SOURCE: 76 FR 57493, Sept. 15, 2011, unless otherwise noted.

#### § 535.1 Scope.

This part establishes fuel consumption standards pursuant to 49 U.S.C. 32902(k) for work trucks and commercial medium-duty and heavy-duty on-highway vehicles (hereafter referenced as heavy-duty vehicles) and engines manufactured for sale in the United States and establishes a credit program manufacturers may use to comply with standards and requirements for manufacturers to provide reports to the National Highway Traffic Safety Administration regarding their efforts to reduce the fuel consumption of these vehicles.

#### § 535.2 Purpose.

The purpose of this part is to reduce the fuel consumption of new heavy-duty vehicles by establishing maximum levels for fuel consumption standards while providing a flexible credit program to assist manufacturers in complying with standards.

#### § 535.3 Applicability.

(a) This part applies to complete vehicle and chassis manufacturers of all new heavy-duty vehicles, as defined in 49 CFR part 523, and to the manufacturers of all heavy-duty engines manufactured for use in the applicable vehicles for each given model year.

(b) Complete vehicle manufacturers, for the purpose of this part, include manufacturers that produce heavy-duty pickup trucks and vans or truck tractors as complete vehicles and that hold the EPA certificate of conformity.

(c) Chassis manufacturers, for the purpose of this part, include manufacturers that produce incomplete vehicles constructed for use as heavy-duty pickup trucks or vans or heavy-duty vocational vehicles and that hold the EPA certificate of conformity. Some vocational vehicle manufacturers are

both chassis and complete vehicle manufacturers. These manufacturers will be regulated as chassis manufacturers under this program.

(d) Engine manufacturer, for the purpose of this part, means a manufacturer that manufactures engines for heavy-duty vehicles and holds the EPA certificate of conformity.

(e) The heavy-duty vehicles, chassis and engines excluded from the requirements of this part include:

(1) Recreational vehicles, including motor homes.

(2) Vehicles and engines exempted by EPA in accordance with 40 CFR parts 1036 and 1037.

(f) Vehicles and engines produced by small business manufacturers as defined by the Small Business Administration at 13 CFR 121.201 are exempted as specified in § 535.8(h).

(g) Heavy-duty off-road vehicles meeting the criteria in 49 CFR part 523 are exempt without request from vehicle standards of § 535.5(b). Manufacturers of vehicles not meeting the criteria for the heavy-duty off-road vehicle exclusion may submit a petition as specified in § 535.8(h) to EPA and NHTSA for an exclusion from the vehicle standards of § 535.5(b).

(h) A vehicle manufacturer that completes assembly of a vehicle at two or more facilities may ask to use as the date of manufacture for that vehicle the date on which manufacturing is completed at the place of main assembly, consistent with provisions of 49 CFR 567.4, as the model year. Note that such staged assembly is subject to the provisions of 40 CFR 1068.260(c). NHTSA's allowance of this provision is effective when EPA approves the manufacturer's certificates of conformity for these vehicles.

#### § 535.4 Definitions.

The terms manufacture and manufacturer are used as defined in section 501 of the Act and the terms commercial medium-duty and heavy-duty on-highway vehicle, fuel and work truck are used as defined in 49 U.S.C. 32901.

*A to B testing* means testing performed in pairs to allow comparison of vehicle A to vehicle B.

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*Act* means the Motor Vehicle Information and Cost Savings Act, as amended by Pub. L. 94–163 and 96–425.

*Administrator* means the Administrator of the National Highway Traffic Safety Administration (NHTSA) or the Administrator's delegate.

*Advanced technology* means vehicle technology certified under 40 CFR 1036.615 and 1037.615.

*Averaging set* means, a set of engines or vehicles in which fuel consumption credits may be exchanged. Credits generated by one engine or vehicle family may only be used by other respective engine or vehicle families in the same averaging set. Note that an averaging set may comprise more than one regulatory subcategory. The averaging sets for this HD program are defined as follows:

- (1) Heavy-duty pickup trucks and vans.
- (2) Vocational light-heavy vehicles at or below 19,500 pounds GVWR.
- (3) Vocational and tractor medium-heavy vehicles above 19,500 pounds GVWR but at or below 33,000 pounds GVWR.
- (4) Vocational and tractor heavy-heavy vehicles above 33,000 pounds GVWR.
- (5) Compression-ignition light heavy-duty engines for Class 2b to 5 vehicles with a GVWR above 8,500 pounds but at or below 19,500 pounds.
- (6) Compression-ignition medium heavy-duty engines for Class 6 and 7 vehicles with a GVWR above 19,500 but at or below 33,000 pounds.
- (7) Compression-ignition heavy heavy-duty engines for Class 8 vehicles with a GVWR above 33,000 pounds.
- (8) Spark-ignition engines in Class 2b to 8 vehicles with a GVWR above 8,500 pounds.

*Base tire* for heavy-duty vehicles means the tire specified as standard equipment by a manufacturer on each subconfiguration of a model type.

*Cab-complete vehicle* has the meaning given in 49 CFR part 523.

*Carryover* means relating to certification based on emission data generated from an earlier model year.

*Certificate holder* means the manufacturer who holds the certificate of conformity for the vehicle or engine and that assigns the model year based on

the date when its manufacturing operations are completed relative to its annual model year period.

*Certificate of Conformity* means an approval document granted by the EPA to a manufacturer that submits an application for a vehicle or engine emissions family in 40 CFR 1036.205 and 1037.205. A certificate of conformity is valid from the indicated effective date until December 31 of the model year for which it is issued. The certificate must be renewed annually for any vehicle a manufacturer continues to produce.

*Certification* means process of obtaining a certificate of conformity for a vehicle family that complies with the emission standards and requirements in this part.

*Certified emission level* means the highest deteriorated emission level in an engine family for a given pollutant from the applicable transient and/or steady-state testing rounded to the same number of decimal places as the applicable standard. Note that you may have two certified emission levels for CO<sub>2</sub> if you certify a family for both vocational and tractor use.

*Chassis-cab* means the incomplete part of a vehicle that includes a frame, a completed occupant compartment and that requires only the addition of cargo-carrying, work-performing, or load-bearing components to perform its intended functions.

*Chief Counsel* means the NHTSA Chief Counsel, or his or her designee.

*Complete sister vehicle* is a complete vehicle of the same configuration as a cab-complete vehicle.

*Complete vehicle* has the meaning given in 49 CFR part 523.

*Compression-ignition* means relating to a type of reciprocating, internal-combustion engine, such as a diesel engine, that is not a spark-ignition engine.

*Configuration* means a subclassification within a test group which is based on engine code, transmission type and gear ratios, final drive ratio, and other parameters which the EPA designates.

*Credits (or fuel consumption credits)* in this part means an earned allowance recognizing the fuel consumption of a particular manufacturer's vehicles or engines within a particular averaging set exceeds (credit surplus or positive

credits) or falls below (credit shortfall, deficit or negative credits) that manufacturer's fuel consumption standard(s) for the regulatory subcategory(s) that make-up the averaging set for a given model year, or purchased allowance. The value of an earned credit is calculated according to § 535.7.

*Curb weight* has the meaning given in 40 CFR 86.1803.

*Date of manufacture* means the date on which the certifying vehicle manufacturer completes its manufacturing operations, except as follows:

(1) Where the certificate holder is an engine manufacturer that does not manufacture the chassis, the date of manufacture of the vehicle is based on the date assembly of the vehicle is completed.

(2) EPA and NHTSA may approve an alternate date of manufacture based on the date on which the certifying (or primary) vehicle manufacturer completes assembly at the place of main assembly, consistent with the provisions of 40 CFR 1037.601 and 49 CFR 567.4.

*Day cab* means a type of truck tractor cab that is not a "sleeper cab", as defined in this section.

*Dedicated vehicle* has the same meaning as dedicated automobile as defined in 49 U.S.C. 32901(a)(8). A dedicated automobile means an automobile that operates only on alternative fuels like E85 or natural gas, etc.

*Dual fueled (multi-fuel or flexible-fuel vehicle)* has the same meaning as dual fueled automobile as defined in 49 U.S.C. 32901(a)(9). For example, a vehicle that operates on gasoline and E85 or a plug-in hybrid electric vehicle is considered a dual fueled vehicle.

*Electric vehicle* means a vehicle that does not include an engine, and is powered solely by an external source of electricity and/or solar power. Note that this does not include electric hybrid or fuel-cell vehicles that use a chemical fuel such as gasoline, diesel fuel, or hydrogen. Electric vehicles may also be referred to as all-electric vehicles to distinguish them from hybrid vehicles.

*Engine family* has the meaning given in 40 CFR 1036.230.

*Family certification level (FCL)* means the family certification limit for an en-

gine family as defined in 40 CFR 1036.801.

*Family emission limit (FEL)* means the family emission limit for a vehicle family as defined in 40 CFR 1037.801.

*Final-stage manufacturer* has the meaning given in 49 CFR 567.3.

*Fleet* in this part means all the heavy-duty vehicles or engines within each of the regulatory sub-categories that are manufactured by a manufacturer in a particular model year and that are subject to fuel consumption standards under § 535.5.

*Fleet average fuel consumption* is the calculated average fuel consumption performance value for a manufacturer's fleet derived from the production weighted fuel consumption values of the unique vehicle configurations within each vehicle model type that makes up that manufacturer's vehicle fleet in a given model year. In this part, the fleet average fuel consumption value is determined for each manufacturer's fleet of heavy-duty pickup trucks and vans.

*Fleet average fuel consumption standard* is the actual average fuel consumption standard for a manufacturer's fleet derived from the production weighted fuel consumption standards of each unique vehicle configuration, based on payload, tow capacity and drive configuration (2, 4 or all-wheel drive), of the model types that makes up that manufacturer's vehicle fleet in a given model year. In this part, the fleet average fuel consumption standard is determined for each manufacturer's fleet of heavy-duty pickup trucks and vans.

*Fuel cell* means an electrochemical cell that produces electricity via the non-combustion reaction of a consumable fuel, typically hydrogen.

*Fuel cell electric vehicle* means a motor vehicle propelled solely by an electric motor where energy for the motor is supplied by a fuel cell.

*Fuel efficiency* means the amount of work performed for each gallon of fuel consumed.

*Good engineering judgment* has the meaning given in 40 CFR 1068.30. See 40 CFR 1068.5 for the administrative process used to evaluate good engineering judgment.

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*Gross combination weight rating (GCWR)* has the meaning given in 49 CFR part 523.

*Gross vehicle weight rating (GVWR)* has the meaning given in 49 CFR part 523.

*Heavy-duty vehicle* has the meaning given in 49 CFR part 523.

*Hybrid engine or hybrid powertrain* means an engine or powertrain that includes energy storage features other than a conventional battery system or conventional flywheel. Supplemental electrical batteries and hydraulic accumulators are examples of hybrid energy storage systems. Note that certain provisions in this part treat hybrid engines and powertrains intended for vehicles that include regenerative braking different than those intended for vehicles that do not include regenerative braking.

*Hybrid vehicle* means a vehicle that includes energy storage features (other than a conventional battery system or conventional flywheel) in addition to an internal combustion engine or other engine using consumable chemical fuel. Supplemental electrical batteries and hydraulic accumulators are examples of hybrid energy storage systems. Note that certain provisions in this part treat hybrid vehicles that include regenerative braking different than those that do not include regenerative braking.

*Incomplete vehicle* has the meaning given in 49 CFR part 523. For the purpose of this regulation, a manufacturer may request EPA and NHTSA to allow the certification of a vehicle as an incomplete vehicle if it manufactures the engine and sells the unassembled chassis components, provided it does not produce and sell the body components necessary to complete the vehicle.

*Innovative technology* means technology certified under 40 CFR 1037.610.

*Liquefied petroleum gas (LPG)* has the meaning given in 40 CFR 1036.801.

*Low rolling resistance tire* means a tire on a vocational vehicle with a tire rolling resistance level (TRRL) of 7.7 kg/metric ton or lower, a steer tire on a tractor with a TRRL of 7.7 kg/metric ton or lower, or a drive tire on a tractor with a TRRL of 8.1 kg/metric ton or lower.

*Model type* has the meaning given in 40 CFR 600.002.

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*Model year* as it applies to engines means the manufacturer's annual new model production period, except as restricted under this definition. It must include January 1 of the calendar year for which the model year is named, may not begin before January 2 of the previous calendar year, and it must end by December 31 of the named calendar year. Manufacturers may not adjust model years to circumvent or delay compliance with standards.

*Model year* as it applies to vehicles means the manufacturer's annual new model production period, except as restricted under this definition and 40 CFR part 85, subpart X. It must include January 1 of the calendar year for which the model year is named, may not begin before January 2 of the previous calendar year, and it must end by December 31 of the named calendar year.

(1) The manufacturer who holds the certificate of conformity for the vehicle must assign the model year based on the date when its manufacturing operations are completed relative to its annual model year period.

(2) Unless a vehicle is being shipped to a secondary manufacturer that will hold the certificate of conformity, the model year must be assigned prior to introduction of the vehicle into U.S. commerce. The certifying manufacturer must redesignate the model year if it does not complete its manufacturing operations within the originally identified model year. A vehicle introduced into U.S. commerce without a model year is deemed to have a model year equal to the calendar year of its introduction into U.S. commerce unless the certifying manufacturer assigns a later date.

*Natural gas* has the meaning given in 40 CFR 1036.801. Vehicles that use a pilot-ignited natural gas engine (which uses a small diesel fuel ignition system), are still considered natural gas vehicles.

*NHTSA Enforcement* means the NHTSA Associate Administrator for Enforcement, or his or her designee.

*Party* means the person alleged to have committed a violation of § 535.9, and includes manufacturers of vehicles and manufacturers of engines.

*Payload* means in this part the resultant of subtracting the curb weight from the gross vehicle weight rating.

*Petroleum* has the meaning given in 40 CFR 1036.801.

*Pickup truck* has the meaning given in 49 CFR part 523.

*Plug-in hybrid electric vehicle (PHEV)* means a hybrid electric vehicle that has the capability to charge the battery or batteries used for vehicle propulsion from an off-vehicle electric source, such that the off-vehicle source cannot be connected to the vehicle while the vehicle is in motion.

*Power take-off (PTO)* means a secondary engine shaft or other system on a vehicle that provides substantial auxiliary power for purposes unrelated to vehicle propulsion or normal vehicle accessories such as air conditioning, power steering, and basic electrical accessories. A typical PTO uses a secondary shaft on the engine to transmit power to a hydraulic pump that powers auxiliary equipment such as a boom on a bucket truck.

*Primary intended service class* has the meaning for engines as specified in 40 CFR 1036.140.

*Rechargeable Energy Storage System (RESS)* means the component(s) of a hybrid engine or vehicle that store recovered energy for later use, such as the battery system in a electric hybrid vehicle.

*Regulatory category* means each of the three types of heavy-duty vehicles defined in 49 CFR 523.6 and the heavy-duty engines used in these heavy-duty vehicles.

*Regulatory subcategory* means the subgroups in each regulatory category to which fuel consumption requirements apply, and are defined as follows:

- (1) Heavy-duty pick-up trucks and vans.
- (2) Vocational light-heavy vehicles at or below 19,500 pounds GVWR.
- (3) Vocational medium-heavy vehicles above 19,500 pounds GVWR but at or below 33,000 pounds GVWR.
- (4) Vocational heavy-heavy vehicles above 33,000 pounds GVWR.
- (5) Low roof day cab tractors with a GVWR above 26,000 pounds but at or below 33,000 pounds.

- (6) Mid roof day cab tractors with a GVWR above 26,000 pounds but at or below 33,000 pounds.

- (7) High roof day cab tractors with a GVWR above 26,000 pounds but at or below 33,000 pounds.

- (8) Low roof day cab tractors above 33,000 pounds GVWR.

- (9) Mid roof day cab tractors above 33,000 pounds GVWR.

- (10) High roof day cab tractors above 33,000 pounds GVWR.

- (11) Low roof sleeper cab tractors above 33,000 pounds GVWR.

- (12) Mid roof sleeper cab tractors above 33,000 pounds GVWR.

- (13) High roof sleeper cab tractors above 33,000 pounds GVWR.

- (14) Compression-ignition light heavy-duty engines in Class 2b to 5 vehicles with a GVWR above 8,500 pounds but at or below 19,500 pounds.

- (15) Compression-ignition medium heavy-duty engines in Class 6 and 7 vocational vehicles with a GVWR above 19,500 but at or below 33,000 pounds.

- (16) Compression-ignition heavy heavy-duty engines in Class 8 vocational vehicles with a GVWR above 33,000 pounds.

- (17) Compression-ignition medium heavy-duty engines in Class 7 tractors with a GVWR above 26,000 pounds but at or below 33,000 pounds.

- (18) Compression-ignition heavy heavy-duty engines in Class 8 tractors with a GVWR above 33,000 pounds.

- (19) Spark-ignition engines in Class 2b to 8 vehicles with a GVWR above 8,500 pounds.

*Roof height* means the maximum height of a vehicle (rounded to the nearest inch), excluding narrow accessories such as exhaust pipes and antennas, but including any wide accessories such as roof fairings. Measure roof height of the vehicle configured to have its maximum height that will occur during actual use, with properly inflated tires and no driver, passengers, or cargo onboard. Determine the base roof height on fully inflated tires having a static loaded radius equal to the arithmetic mean of the largest and smallest static loaded radius of tires a manufacturer offers or a standard tire EPA approves. If a vehicle is equipped with an adjustable roof fairing, measure the roof height with the fairing in

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its lowest setting. Once the maximum height is determined, roof heights are divided into the following categories:

(1) Low-roof means a vehicle with a roof height of 120 inches or less.

(2) Mid-roof means a vehicle with a roof height between 121 and 147 inches.

(3) High-roof means a vehicle with a roof height of 148 inches or more.

*Service class group* means a group of engine and vehicle averaging sets defined as follows:

(1) Spark-ignition engines, light heavy-duty compression-ignition engines, light heavy-duty vocational vehicles and heavy-duty pickup trucks and vans.

(2) Medium heavy-duty compression-ignition engines and medium heavy-duty vocational vehicles and tractors.

(3) Heavy heavy-duty compression-ignition engines and heavy heavy-duty vocational vehicles and tractors.

*Sleeper cab* means a type of truck cab that has a compartment behind the driver's seat intended to be used by the driver for sleeping. This includes both cabs accessible from the driver's compartment and those accessible from outside the vehicle.

*Spark-ignition engines* means relating to a gasoline-fueled engine or any other type of engine with a spark plug (or other sparking device) and with operating characteristics significantly similar to the theoretical Otto combustion cycle. Spark-ignition engines usually use a throttle to regulate intake air flow to control power during normal operation.

*Subconfiguration* means a unique combination within a vehicle configuration of equivalent test weight, road-load horsepower, and any other operational characteristics or parameters that EPA determines may significantly affect CO<sub>2</sub> emissions within a vehicle configuration.

*Test group* means the multiple vehicle lines and model types that share critical emissions and fuel consumption related features and that are certified as a group by a common certificate of conformity issued by EPA and is used collectively with other test groups within an averaging set or regulatory subcategory and is used by NHTSA for determining the fleet average fuel consumption.

*Tire rolling resistance level (TRRL)* means a value with units of kg/metric ton that represents that rolling resistance of a tire configuration. TRRLs are used as inputs to the GEM model under 40 CFR 1037.520. Note that a manufacturer may assign a value higher than a measured rolling resistance of a tire configuration.

*Towing capacity* in this part is equal to the resultant of subtracting the gross vehicle weight rating from the gross combined weight rating.

*Trade* means to exchange fuel consumption credits, either as a buyer or a seller.

*Truck tractor* has the meaning given in 49 CFR 571.3. This includes most heavy-duty vehicles specifically designed for the primary purpose of pulling trailers, but does not include vehicles designed to carry other loads. For purposes of this definition "other loads" would not include loads carried in the cab, sleeper compartment, or toolboxes. Examples of vehicles that are similar to tractors but that are not tractors under this part include dromedary tractors, automobile haulers, straight trucks with trailers hitches, and tow trucks.

*U.S.-directed production volume* means the number of vehicle units, subject to the requirements of this part, produced by a manufacturer for which the manufacturer has a reasonable assurance that sale was or will be made to ultimate purchasers in the United States.

*Useful life* has the meaning given in 40 CFR 1037.801.

*Vehicle configuration* means a unique combination of vehicle hardware and calibration (related to measured or modeled emissions) within a vehicle family. Vehicles with hardware or software differences, but that have no hardware or software differences related to measured or modeled emissions or fuel consumption can be included in the same vehicle configuration. Note that vehicles with hardware or software differences related to measured or modeled emissions or fuel consumption are considered to be different configurations even if they have the same GEM inputs and FEL. Vehicles within a vehicle configuration differ only with respect to normal production variability or factors unrelated to

measured or modeled emissions and fuel consumption for EPA and NHTSA.

*Vehicle family* has the meaning given in 40 CFR 1037.230.

*Vehicle service class* has the meaning for vehicles as specified in the 40 CFR 1037.801.

*Vocational tractor* has the meaning given in 40 CFR 1037.630.

*Zero emissions vehicle* means an electric vehicle or a fuel cell vehicle.

[76 FR 57493, Sept. 15, 2011, as amended at 76 FR 65971, Oct. 25, 2011]

**§ 535.5 Standards.**

(a) *Heavy-duty pickup trucks and vans.* Each manufacturer of a fleet of heavy-duty pickup trucks and vans shall comply with the fuel consumption standards in this paragraph (a) expressed in gallons per 100 miles. If the manufacturer's fleet includes conventional vehicles (gasoline, diesel and alternative fueled vehicles) and advanced technology vehicles (hybrids with regenerative braking, vehicles equipped with Rankine-cycle engines, electric and fuel cell vehicles), it should divide its fleet into two separate fleets each with its own separate fleet average fuel consumption standard which a manufacturer must comply with the requirements of this paragraph (a).

(1) *Mandatory standards.* For model years 2016 and later, each manufacturer must comply with the fleet average standard derived from the unique subconfiguration target standards (or groups of subconfigurations approved by EPA in accordance with 40 CFR 1037.104) of the model types that make up the manufacturer's fleet in a given model year. Each subconfiguration has a unique attribute-based target standard, defined by each group of vehicles having the same payload, towing capacity and whether the vehicles are equipped with a 2-wheel or 4-wheel drive configuration.

(2) *Subconfiguration target standards.* (i) Two alternatives exist for determining the subconfiguration target standards for model years 2016 and later. For each alternative, separate standards exist for compression-ignition and spark-ignition vehicles:

(A) The first alternative allows manufacturers to determine a fixed fuel

consumption standard that is constant over the model years; and

(B) The second alternative allows manufacturers to determine standards that are phased-in gradually each year.

(ii) Calculate the subconfiguration target standards as specified in this paragraph (a)(2)(ii), using the appropriate coefficients from Table 1 choosing between the alternatives in paragraphs (a)(2)(i)(A) and (B) of this section. For electric or fuel cell heavy-duty vehicles, use compression-ignition vehicle coefficients "c" and "d" and for hybrid (including plug-in hybrid), dedicated and dual-fueled vehicles, use coefficients "c" and "d" appropriate for the engine type used. Round each standard to the nearest 0.01 gallons per 100 miles and specify all weights in pounds rounded to the nearest pound. Calculate the subconfiguration target standards using the following equation:

$$\text{Subconfiguration Target Standard (gallons per 100 miles)} = [c \times (\text{WF})] + d$$

Where:

WF = Work Factor =  $[0.75 \times (\text{Payload Capacity} + \text{Xwd})] + [0.25 \times \text{Towing Capacity}]$

Xwd = 4wd Adjustment = 500 lbs if the vehicle group is equipped with 4wd and all-wheel drive, otherwise equals 0 lbs for 2wd.

Payload Capacity = GVWR (lbs) - Curb Weight (lbs) (for each vehicle group)

Towing Capacity = GCWR (lbs) - GVWR (lbs) (for each vehicle group)

TABLE 1—EQUATION COEFFICIENTS FOR SUBCONFIGURATION TARGET STANDARDS

Model year	c	d
<b>Alternative 1—Fixed Target Standards</b>		
Compression-ignition Vehicle Coefficients for Model Years 2016 and later		
2016–2018 .....	0.000432	3.33
2019 and later .....	0.000409	3.14
Spark-ignition Vehicle Coefficients for Model Years 2016 and later		
2016–2018 .....	0.000513	3.96
2019 and later .....	0.000495	3.81
<b>Alternative 2—Phased-in Target Standards</b>		
Compression-ignition Vehicle Coefficients for Model Years 2016 and later		
2016 .....	0.000452	3.48
2017 .....	0.000437	3.37