

Appendix Figure 1—Calculation of Manufacturer X's fleet average fuel economy standard using Table II:

Fleet average fuel economy standard =

$$= \frac{(\text{Manufacturer's Domestic Passenger Automobile Production for Applicable Model Year})}{\sum_i \left(\frac{\text{Group}_1 \text{ Production}}{\text{Group}_1 \text{ Target Standard}} + \frac{\text{Group}_2 \text{ Production}}{\text{Group}_2 \text{ Target Standard}} + \dots + \frac{\text{Group}_9 \text{ Production}}{\text{Group}_9 \text{ Target Standard}} \right)}$$

$$= \frac{(27,500)}{\left(\frac{1500}{35.01} + \frac{2000}{35.14} + \frac{2000}{35.08} + \frac{1000}{35.95} + \frac{3000}{35.81} + \frac{8000}{30.33} + \frac{2000}{29.99} + \frac{5000}{29.52} + \frac{3000}{29.79} \right)}$$

= 31.6 mpg

Appendix Figure 2—Calculation of Manufacturer X's actual fleet average fuel economy performance level using Table I:
Fleet average fuel economy performance =

$$= \frac{(\text{Manufacturer's Domestic Passenger Automobile Production for Applicable Model Year})}{\sum_i \left(\frac{\text{Group}_1 \text{ Production}}{\text{Group}_1 \text{ Performance}} + \frac{\text{Group}_2 \text{ Production}}{\text{Group}_2 \text{ Performance}} + \dots + \frac{\text{Group}_9 \text{ Production}}{\text{Group}_9 \text{ Performance}} \right)}$$

$$= \frac{(27,500)}{\left(\frac{1500}{34.0} + \frac{2000}{34.6} + \frac{2000}{33.8} + \frac{1000}{34.4} + \frac{3000}{32.9} + \frac{8000}{32.2} + \frac{2000}{33.1} + \frac{5000}{30.6} + \frac{3000}{28.5} \right)}$$

= 32.0 mpg

Note to Appendix Figure 2: Since the actual fleet average fuel economy performance of Manufacturer X's fleet is 32.0 mpg, as compared to its required fleet fuel economy standard of 31.6 mpg, Manufacturer X complied with the CAFE standard for MY 2012 as set forth in § 531.5(c).

[77 FR 63191, Oct. 15, 2012]

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

§ 533.1 Scope.

This part establishes average fuel economy standards pursuant to section 502(b) of the Motor Vehicle Information and Cost Savings Act, as amended, for light trucks.

[42 FR 13807, Mar. 14, 1977, as amended at 43 FR 12013, Mar. 23, 1978]

PART 533—LIGHT TRUCK FUEL ECONOMY STANDARDS

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APPENDIX TO PART 533—EXAMPLE OF CALCULATING COMPLIANCE UNDER § 533.5(i)

§ 533.2 Purpose.

The purpose of this part is to increase the fuel economy of light trucks by establishing minimum levels of average fuel economy for those vehicles.

[42 FR 13807, Mar. 14, 1977, as amended at 43 FR 12013, Mar. 23, 1978]

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§ 533.3 Applicability.

This part applies to manufacturers of light trucks.

[42 FR 13807, Mar. 14, 1977, as amended at 43 FR 12013, Mar. 23, 1978]

§ 533.4 Definitions.

(a) *Statutory terms.* (1) The terms *average fuel economy*, *average fuel economy standard*, *fuel economy*, *import*, *manufacturer*, and *model year* are used as defined in section 501 of the Act.

(2) The term *automobile* is used as defined in section 501 of the Act and in accordance with the determinations in part 523 of this chapter.

(3) The term *domestically manufactured* is used as defined in section 503(b)(2)(E) of the Act.

(b) *Other terms.* As used in this part, unless otherwise required by the context—

(1) *Act* means the Motor Vehicle Information Cost Savings Act, as amended by Pub. L. 94–163.

(2) *Light truck* is used in accordance with the determinations in part 523 of this chapter.

Captive import means with respect to a light truck, one which is not domestically manufactured but which is imported in the 1980 model year or there-

after by a manufacturer whose principal place of business is in the United States.

4-wheel drive, general utility vehicle means a 4-wheel drive, general purpose automobile capable of off-highway operation that has a wheelbase of not more than 280 centimeters, and that has a body shape similar to 1977 Jeep CJ-5 or CJ-7, or the 1977 Toyota Land Cruiser.

Basic engine means a unique combination of manufacturer, engine displacement, number of cylinders, fuel system (as distinguished by number of carburetor barrels or use of fuel injection), and catalyst usage.

Limited product line light truck means a light truck manufactured by a manufacturer whose light truck fleet is powered exclusively by basic engines which are not also used in passenger automobiles.

[42 FR 13807, Mar. 14, 1977, as amended at 43 FR 12013, Mar. 23, 1978; 43 FR 46547, Oct. 10, 1978; 58 FR 18029, Apr. 7, 1993]

§ 533.5 Requirements.

(a) Each manufacturer of light trucks shall comply with the following fleet average fuel economy standards, expressed in miles per gallon, in the model year specified as applicable:

TABLE I

Model year	2-wheel drive light trucks		4-wheel drive light trucks		Limited product line light trucks
	Captive imports	Other	Captive imports	Other	
1979	17.2	15.8			
1980	16.0	16.0	14.0	14.0	14.0
1981	16.7	16.7	15.0	15.0	14.5

TABLE II

Model year	Combined standard		2-wheel drive light trucks		4-wheel drive light trucks	
	Captive imports	Others	Captive imports	Others	Captive imports	Others
1982	17.5	17.5	18.0	18.0	16.0	16.0
1983	19.0	19.0	19.5	19.5	17.5	17.5
1984	20.0	20.0	20.3	20.3	18.5	18.5
1985	19.5	19.5	19.7	19.7	18.9	18.9
1986	20.0	20.0	20.5	20.5	19.5	19.5
1987	20.5	20.5	21.0	21.0	19.5	19.5
1988	20.5	20.5	21.0	21.0	19.5	19.5
1989	20.5	20.5	21.5	21.5	19.0	19.0
1990	20.0	20.0	20.5	20.5	19.0	19.0
1991	20.2	20.2	20.7	20.7	19.1	19.1

TABLE III

Model year	Combined standard	
	Captive imports	Other
1992	20.2	20.2
1993	20.4	20.4
1994	20.5	20.5
1995	20.6	20.6

TABLE IV

Model year	Standard
2001	20.7
2002	20.7
2003	20.7
2004	20.7
2005	21.0
2006	21.6
2007	22.2
2008	22.5
2009	23.1
2010	23.5

Figure 1:

$$Required_Fuel_Economy_Level = \frac{N}{\sum_i \frac{N_i}{T_i}}$$

Where:

N is the total number (sum) of light trucks produced by a manufacturer;
 N_i is the number (sum) of the i th light truck model type produced by a manufacturer;
 and

T_i is the fuel economy target of the i th light truck model type, which is determined according to the following formula, rounded to the nearest hundredth:

$$T = \frac{1}{\frac{1}{a} + \left(\frac{1}{b} - \frac{1}{a}\right) \frac{e^{(x-c)d}}{1 + e^{(x-c)d}}}$$

Where:

Parameters a , b , c , and d are defined in Table V;

$e = 2.718$; and
 x = footprint (in square feet, rounded to the nearest tenth) of the model type.

TABLE V—PARAMETERS FOR THE LIGHT TRUCK FUEL ECONOMY TARGETS FOR MYS 2008–2011

Model year	Parameters			
	a (mpg)	b (mpg)	c (gal/mi/ft ²)	d (gal/mi)
2008	28.56	19.99	49.30	5.58
2009	30.07	20.87	48.00	5.81
2010	29.96	21.20	48.49	5.50
2011	27.10	21.10	56.41	4.28

Figure 2:

$$CAFE_{required} = \frac{\sum_i PRODUCTION_i}{\sum_i \frac{PRODUCTION_i}{TARGET_i}}$$

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Where:

$CAFE_{required}$ is the fleet average fuel economy standard for a given light truck fleet;

Subscript i is a designation of multiple groups of light trucks, where each group's designation, *i.e.*, $i = 1, 2, 3$, etc., represents light trucks that share a unique model type and footprint within the applicable fleet.

$Production_i$ is the number of light trucks produced for sale in the United States within each i th designation, *i.e.*, which share the same model type and footprint;

$TARGET_i$ is the fuel economy target in miles per gallon (mpg) applicable to the footprint of light trucks within each i th designation, *i.e.*, which share the same model type and footprint, calculated according to either Figure 3 or Figure 4, as appropriate, and rounded to the nearest hundredth of a mpg, *i.e.*, $35.455 = 35.46$ mpg, and the summations in the numerator and denominator are both performed over all models in the fleet in question.

Figure 3:

$$TARGET = \frac{1}{MIN \left[MAX \left(c \times FOOTPRINT + d, \frac{1}{a} \right), \frac{1}{b} \right]}$$

Where:

$TARGET$ is the fuel economy target (in mpg) applicable to vehicles of a given footprint ($FOOTPRINT$, in square feet);

Parameters a, b, c , and d are defined in Table VI; and

The MIN and MAX functions take the minimum and maximum, respectively, of the included values.

TABLE VI—PARAMETERS FOR THE LIGHT TRUCK FUEL ECONOMY TARGETS FOR MYS 2012–2016

Model year	Parameters			
	a (mpg)	b (mpg)	c (gal/mi/ft ²)	d (gal/mi)
2012	29.82	22.27	0.0004546	0.014900
2013	30.67	22.74	0.0004546	0.013968
2014	31.38	23.13	0.0004546	0.013225
2015	32.72	23.85	0.0004546	0.011920
2016	34.42	24.74	0.0004546	0.010413

Figure 4:

Figure 4:

$$TARGET = MAX \left(\frac{1}{MIN \left[MAX \left(c \times FOOTPRINT + d, \frac{1}{a} \right), \frac{1}{b} \right]}, \frac{1}{MIN \left[MAX \left(g \times FOOTPRINT + h, \frac{1}{e} \right), \frac{1}{f} \right]} \right)$$

Where:

$TARGET$ is the fuel economy target (in mpg) applicable to vehicles of a given footprint ($FOOTPRINT$, in square feet);

Parameters a, b, c, d, e, f, g , and h are defined in Table VII; and

The MIN and MAX functions take the minimum and maximum, respectively, of the included values.

TABLE VII—PARAMETERS FOR THE LIGHT TRUCK FUEL ECONOMY TARGETS FOR MYS 2017–2025

Model year	Parameters							
	a (mpg)	b (mpg)	c (gal/mi/ft ²)	d (gal/mi)	e (mpg)	f (mpg)	g (gal/mi/ft ²)	h (gal/mi)
2017	36.26	25.09	0.0005484	0.005097	35.10	25.09	0.0004546	0.009851
2018	37.36	25.20	0.0005358	0.004797	35.31	25.20	0.0004546	0.009682
2019	38.16	25.25	0.0005265	0.004623	35.41	25.25	0.0004546	0.009603
2020	39.11	25.25	0.0005140	0.004494	35.41	25.25	0.0004546	0.009603

TABLE VII—PARAMETERS FOR THE LIGHT TRUCK FUEL ECONOMY TARGETS FOR MYS 2017–2025—
Continued

Model year	Parameters							
	<i>a</i> (mpg)	<i>b</i> (mpg)	<i>c</i> (gal/mi/ft ²)	<i>d</i> (gal/mi)	<i>e</i> (mpg)	<i>f</i> (mpg)	<i>g</i> (gal/mi/ft ²)	<i>h</i> (gal/mi)
2021	41.80	25.25	0.0004820	0.004164	35.41	25.25	0.0004546	0.009603
2022	43.79	26.29	0.0004607	0.003944	35.41	25.25	0.0004546	0.009603
2023	45.89	27.53	0.0004404	0.003735	35.41	25.25	0.0004546	0.009603
2024	48.09	28.83	0.0004210	0.003534	35.41	25.25	0.0004546	0.009603
2025	50.39	30.19	0.0004025	0.003343	35.41	25.25	0.0004546	0.009603

(b)(1) For model year 1979, each manufacturer may:

(i) Combine its 2- and 4-wheel drive light trucks and comply with the average fuel economy standard in paragraph (a) of this section for 2-wheel drive light trucks; or

(ii) Comply separately with the two standards specified in paragraph (a) of this section.

(2) For model year 1979, the standard specified in paragraph (a) of this section for 4-wheel drive light trucks applies only to 4-wheel drive general utility vehicles. All other 4-wheel drive light trucks in that model year shall be included in the 2-wheel drive category for compliance purposes.

(c) For model years 1980 and 1981, manufacturers of limited product line light trucks may:

(1) Comply with the separate standard for limited product line light trucks, or

(2) Comply with the other standards specified in § 533.5(a), as applicable.

(d) For model years 1982–91, each manufacturer may:

(1) Combine its 2- and 4-wheel drive light trucks (segregating captive import and other light trucks) and comply with the combined average fuel economy standard specified in paragraph (a) of this section; or

(2) Comply separately with the 2-wheel drive standards and the 4-wheel drive standards (segregating captive import and other light trucks) specified in paragraph (a) of this section.

(e) For model year 1992, each manufacturer shall comply with the average fuel economy standard specified in paragraph (a) of this section (segregating captive import and other light trucks).

(f) For each model year 1996 and thereafter, each manufacturer shall

combine its captive imports with its other light trucks and comply with the fleet average fuel economy standard in paragraph (a) of this section.

(g) For model years 2008–2010, at a manufacturer's option, a manufacturer's light truck fleet may comply with the fuel economy standard calculated for each model year according to Figure 1 and the appropriate values in Table V, with said option being irrevocably chosen for that model year and reported as specified in § 537.8.

(h) For model year 2011, a manufacturer's light truck fleet shall comply with the fleet average fuel economy standard calculated for that model year according to Figure 1 and the appropriate values in Table V.

(i) For model years 2012–2016, a manufacturer's light truck fleet shall comply with the fleet average fuel economy standard calculated for that model year according to Figures 2 and 3 and the appropriate values in Table VI.

(j) For model years 2017–2025, a manufacturer's light truck fleet shall comply with the fleet average fuel economy standard calculated for that model year according to Figures 2 and 4 and the appropriate values in Table VII.

(k) For model years 2022–2025, each manufacturer shall comply with the standards set forth in paragraph (j) in this section, if NHTSA determines in a rulemaking, initiated after January 1, 2017, and conducted in accordance with 49 U.S.C. 32902, that the standards in paragraph (j) are the maximum feasible standards for model years 2022–2025. If, for any of those model years, NHTSA determines that the maximum feasible standard for light trucks should be set at a different level, manufacturers shall comply with those different

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standards in lieu of the standards set forth for those model years in paragraph (j), and NHTSA will revise this section to reflect the different standards.

[43 FR 12014, Mar. 23, 1978]

EDITORIAL NOTE: For FEDERAL REGISTER citations affecting § 533.5 see the List of CFR Sections Affected, which appears in the Finding Aids section of the printed volume and at www.fdsys.gov.

§ 533.6 Measurement and calculation procedures.

(a) Any reference to a class of light trucks manufactured by a manufacturer shall be deemed—

(1) To include all light trucks in that class manufactured by persons who control, are controlled by, or are under common control with, such manufacturer; and

(2) To exclude all light trucks in that class manufactured (within the meaning of paragraph (a)(1) of this section) during a model year by such manufacturer which are exported prior to the expiration of 30 days following the end of such model year.

(b) The fleet average fuel economy performance of all vehicles subject to part 533 that are manufactured by a manufacturer in a model year shall be determined in accordance with procedures established by the Administrator of the Environmental Protection Agency under 49 U.S.C. 32904 and set forth in 40 CFR part 600. For model years 2017 to 2025, a manufacturer is eligible to increase the fuel economy performance of light trucks in accordance with procedures established by EPA set forth in 40 CFR part 600, including any adjustments to fuel economy EPA allows, such as for fuel consumption improvements related to air conditioning efficiency, off-cycle technologies, and hybridization and other performance-based technologies for full-size pickup trucks.

(c) The eligibility of a manufacturer to increase its fuel economy performance through use of an off-cycle technology requires an application request made to EPA in accordance with 40 CFR 86.1869–12 and an approval granted by EPA made in consultation with NHTSA. In order to expedite NHTSA's consultation with EPA, a manufacturer's application as part of the off-cycle credit approval process under 40 CFR 86.1869–12(b) or 40 CFR 86.1869–12(c) shall also be submitted to NHTSA at the same time if the manufacturer is seeking off-cycle fuel economy improvement values under the CAFE program for those technologies. For off-cycle technologies which are covered under 40 CFR 86.1869–12(b) or 40 CFR 86.1869–12(c), NHTSA will consult with EPA regarding NHTSA's evaluation of the specific off-cycle technology to ensure its impact on fuel economy and the suitability of using the off-cycle technology to adjust the fuel economy performance. NHTSA will provide its views on the suitability of the technology for that purpose to EPA. NHTSA's evaluation and review will consider:

(1) Whether the technology has a direct impact upon improving fuel economy performance;

(2) Whether the technology is related to crash-avoidance technologies, safety critical systems or systems affecting safety-critical functions, or technologies designed for the purpose of reducing the frequency of vehicle crashes.

(3) Information from any assessments conducted by EPA related to the application, the technology and/or related technologies; and

(4) Any other relevant factors.

[42 FR 13807, Mar. 14, 1977, as amended at 43 FR 12013, Mar. 23, 1978; 77 FR 63194, Oct. 15, 2012]

APPENDIX TO PART 533—EXAMPLE OF CALCULATING COMPLIANCE UNDER § 533.5(1)

Assume a hypothetical manufacturer (Manufacturer X) produces a fleet of light trucks in MY 2012 as follows:

APPENDIX TABLE I

Group	Model type			Description	Actual measured fuel economy (mpg)	Volume
	Carline name	Basic engine (L)	Transmission class			
1	Pickup A 2WD	4	A5	Reg cab, MB	27.1	800
2	Pickup B 2WD	4	M5	Reg cab, MB	27.6	200
3	Pickup C 2WD	4.5	A5	Reg cab, LB	23.9	300
4	Pickup C 2WD	4	M5	Ext cab, MB	23.7	400
5	Pickup C 4WD	4.5	A5	Crew cab, SB	23.5	400
6	Pickup D 2WD	4.5	A6	Crew cab, SB	23.6	400
7	Pickup E 2WD	5	A6	Ext cab, LB	22.7	500
8	Pickup E 2WD	5	A6	Crew cab, MB	22.5	500
9	Pickup F 2WD	4.5	A5	Reg cab, LB	22.5	1,600
10	Pickup F 4WD	4.5	A5	Ext cab, MB	22.3	800
11	Pickup F 4WD	4.5	A5	Crew cab, SB	22.2	800
Total	6,700.					

Note to Appendix Table I: Manufacturer X's required fleet average fuel economy standard level would first be calculated by determining the fuel economy targets applicable to each unique model type and footprint combination for model type groups 1–11 as illustrated in Appendix Table II.

Manufacturer X calculates a fuel economy target standard for each unique model type and footprint combination.

APPENDIX TABLE II

Group	Model type			Description	Base tire size	Wheel-base (inches)	Track width F&R average (inches)	Foot-print (ft²)	Volume	Fuel economy target standard (mpg)
	Carline name	Basic engine (L)	Transmission class							
1	Pickup A 2WD.	4	A5	Reg cab, MB	235/75R15	100.0	68.8	47.8	800	27.30
2	Pickup B 2WD.	4	M5	Reg cab, MB	235/75R15	100.0	68.2	47.4	200	27.44
3	Pickup C 2WD.	4.5	A5	Reg cab, LB	255/70R17	125.0	68.8	59.7	300	23.79
4	Pickup C 2WD.	4	M5	Ext cab, MB	255/70R17	125.0	68.8	59.7	400	23.79
5	Pickup C 4WD.	4.5	A5	Crew cab, SB	275/70R17	150.0	69.0	71.9	400	22.27
6	Pickup D 2WD.	4.5	A6	Crew cab, SB	255/70R17	125.0	68.8	59.7	400	23.79
7	Pickup E 2WD.	5	A6	Ext cab, LB ..	255/70R17	125.0	68.8	59.7	500	23.79
8	Pickup E 2WD.	5	A6	Crew cab, MB.	285/70R17	125.0	69.2	60.1	500	23.68
9	Pickup F 2WD.	4.5	A5	Reg cab, LB	255/70R17	125.0	68.9	59.8	1,600	23.76
10	Pickup F 4WD.	4.5	A5	Ext cab, MB	275/70R17	150.0	69.0	71.9	800	22.27
11	Pickup F 4WD.	4.5	A5	Crew cab, SB	285/70R17	150.0	69.2	72.1	800	22.27
Total ...	6,700.									

Note to Appendix Table II: With the appropriate fuel economy targets determined for each unique model type and footprint combination, Manufacturer X's required fleet average fuel economy standard would be calculated as illustrated in Appendix Figure 1:

APPENDIX FIGURE 1—CALCULATION OF MANUFACTURER X'S FLEET AVERAGE FUEL ECONOMY STANDARD USING TABLE II

Fleet average fuel economy standard=

$$= \frac{\text{(Manufacturer's Light Truck Production for Applicable Model Year)}}{\sum_i \left(\frac{\text{Group}_1 \text{ Production}}{\text{Group}_1 \text{ Target Standard}} + \frac{\text{Group}_2 \text{ Production}}{\text{Group}_2 \text{ Target Standard}} + \dots + \frac{\text{Group}_{11} \text{ Production}}{\text{Group}_{11} \text{ Target Standard}} \right)}$$

$$= \frac{(6,700)}{\left(\frac{800}{27.80} + \frac{200}{27.44} + \frac{800}{28.79} + \frac{400}{28.79} + \frac{400}{22.27} + \frac{400}{28.79} + \frac{500}{28.79} + \frac{500}{28.68} + \frac{1600}{28.76} + \frac{800}{22.27} + \frac{800}{22.27} \right)}$$

= 23.7 mpg

APPENDIX FIGURE 2—CALCULATION OF MANUFACTURER X'S ACTUAL FLEET AVERAGE FUEL ECONOMY PERFORMANCE LEVEL USING TABLE I

Fleet average fuel economy performance =

$$= \frac{\text{(Manufacturer's Light Truck Production for Applicable Model Year)}}{\sum_i \left(\frac{\text{Group}_1 \text{ Production}}{\text{Group}_1 \text{ Performance}} + \frac{\text{Group}_2 \text{ Production}}{\text{Group}_2 \text{ Performance}} + \dots + \frac{\text{Group}_{11} \text{ Production}}{\text{Group}_{11} \text{ Performance}} \right)}$$

$$= \frac{(27,500)}{\left(\frac{1500}{14.0} + \frac{2000}{34.5} + \frac{2000}{33.8} + \frac{1000}{34.4} + \frac{8000}{32.9} + \frac{8000}{32.2} + \frac{2000}{35.1} + \frac{5000}{30.6} + \frac{8000}{28.5} \right)}$$

= 23.3 mpg

NOTE TO APPENDIX FIGURE 2: Since the actual fleet average fuel economy performance of Manufacturer X's fleet is 23.3 mpg, as compared to its required fleet fuel economy standard of 23.7 mpg, Manufacturer X did not comply with the CAFE standard for MY 2012 as set forth in § 533.5(i).

[77 FR 63196, Oct. 15, 2012]

PART 534—RIGHTS AND RESPONSIBILITIES OF MANUFACTURERS IN THE CONTEXT OF CHANGES IN CORPORATE RELATIONSHIPS

Sec.

- 534.1 Scope.
- 534.2 Applicability.
- 534.3 Definitions.
- 534.4 Successors and predecessors.
- 534.5 Manufacturers within control relationships.
- 534.6 Reporting corporate transactions.

534.7 Situations not directly addressed by this part.

AUTHORITY: 49 U.S.C. 32901; delegation of authority at 49 CFR 1.50.

SOURCE: 69 FR 77671, Dec. 28, 2004, unless otherwise noted.

§ 534.1 Scope.

This part defines the rights and responsibilities of manufacturers in the context of changes in corporate relationships for purposes of the fuel economy and fuel consumption programs established by 49 U.S.C. chapter 329.

[76 FR 57492, Sept. 15, 2011]

§ 534.2 Applicability.

This part applies to manufacturers of passenger automobiles, light trucks, heavy-duty vehicles and the engines