HFET FE = the HFET-based highway fuel economy determined under § 600.113–08(b), rounded to the nearest tenth.

(ii) The derived 5-cycle highway fuel economy calculated in paragraph (b)(2)(i)(B) of this section is multiplied by 0.95 and rounded to the nearest one tenth of a mile per gallon.

(iii) (A) If the vehicle-specific 5-cycle highway fuel economy of the vehicle tested in paragraph (b)(2)(i)(A) of this section is greater than or equal to the value determined in paragraph (b)(2)(ii) of this section, then the manufacturer may base the highway fuel economy estimates for the model types covered by the test group on the derived 5-cycle method specified in § 600.210–08(a)(2) or (b)(2) or § 600.210–12(a)(2) or (b)(2), as applicable.

(B) If the vehicle-specific 5-cycle highway fuel economy determined in paragraph (b)(2)(i)(A) of this section is less than the value determined in paragraph (b)(2)(ii) of this section, the manufacturer may determine the highway fuel economy for the model types covered by the test group on the modified 5-cycle equation specified in § 600.114–08(b)(2) or § 600.114–12(b)(2).

(c) The manufacturer will apply the criteria in paragraph (a) and (b) of this section to every test group for each model year.

(d) The tests used to make the evaluations in paragraphs (a) and (b) of this section will be the procedures for official test determinations under § 86.1835. Adjustments and/or substitutions to the official test data may be made with advance approval of the Administrator.

[76 FR 39547, July 6, 2011, as amended at 76 FR 57380, Sept. 15, 2011]

§ 600.116–12 Special procedures related to electric vehicles and plug-in hybrid electric vehicles.

(a) Determine fuel economy label values for electric vehicles as specified in §§ 600.210 and 600.311 using the procedures of SAE J1634 (incorporated by reference in § 600.011), with the following clarifications and modifications:

(1) Use one of the following approaches to define end-of-test criteria for vehicles whose maximum speed is less than the maximum speed specified in the driving schedule, where the vehicle's maximum speed is determined, to the nearest 0.1 mph, from observing the highest speed over the first duty cycle (FTP, HFET, etc.):

(i) If the vehicle can follow the driving schedule within the speed tolerances specified in § 86.115 of this chapter up to its maximum speed, the end-of-test criterion is based on the point at which the vehicle can no longer meet the specified speed tolerances up to and including its maximum speed.

(ii) If the vehicle cannot follow the driving schedule within the speed tolerances specified in § 86.115 of this chapter up to its maximum speed, the end-of-test criterion is based on the following procedure:

(A) Measure and record the vehicle's speed (to the nearest 0.1 mph) while making a best effort to follow the specified driving schedule.

(B) This recorded sequence of driving speeds becomes the driving schedule for the test vehicle. Apply the end-of-test criterion based on the point at which the vehicle can no longer meet the specified speed tolerances over this new driving schedule. The driving to establish the new driving schedule may be done separately, or as part of the measurement procedure.

(2) Soak time between repeat duty cycles (four-bag FTP, HFET, etc.) may be up to 30 minutes. No recharging may occur during the soak time.

(3) Recharging the vehicle's battery must start within three hours after the end of testing.

(4) Do not apply the C coefficient adjustment specified in Section 4.4.2.

(5) We may approve alternate measurement procedures with respect to electric vehicles if they are necessary or appropriate for meeting the objectives of this part.

(6) All label values related to fuel economy, energy consumption, and range must be based on 5-cycle testing or on values adjusted to be equivalent to 5-cycle results.

(b) Determine performance values for plug-in hybrid electric vehicles as specified in §§ 600.210 and 600.311 using the procedures of SAE J1711 (incorporated by reference in § 600.011), with the following clarifications and modifications:

(1) To determine fuel economy and CREE values to demonstrate compliance with CAFE and GHG standards, calculate composite values representing combined operation during charge-deplete and charge-sustain operation using the following utility factors except as specified in this paragraph (b):

TABLE 1 OF §600.116–12—FLEET UTILITY FACTORS FOR URBAN "CITY" DRIVING

Schedule range for UDDS phases, miles	Cumulative UF	Sequential UF
3.59	0.125	0.125
7.45	0.243	0.117
11.04	0.338	0.095
14.90	0.426	0.088
18.49	0.497	0.071
22.35	0.563	0.066
25.94	0.616	0.053
29.80	0.666	0.049
33.39	0.705	0.040
37.25	0.742	0.037
40.84	0.772	0.030
44.70	0.800	0.028
48.29	0.822	0.022
52.15	0.843	0.021
55.74	0.859	0.017
59.60	0.875	0.016
63.19	0.888	0.013

TABLE 1 OF §600.116–12—FLEET UTILITY FACTORS FOR URBAN "CITY" DRIVING—Continued

Schedule range for UDDS phases, miles	Cumulative UF	Sequential UF
67.05	0.900	0.012
70.64	0.909	0.010

TABLE 2 OF §600.116–12—FLEET UTILITY FACTORS FOR HIGHWAY DRIVING

Schedule range for HFET, miles	Cumulative UF	Sequential UF
10.3	0.123	0.123
20.6	0.240	0.117
30.9	0.345	0.105
41.2	0.437	0.092
51.5	0.516	0.079
61.8	0.583	0.067
72.1	0.639	0.056

(2) To determine fuel economy and CO_2 emission values for labeling purposes, calculate composite values representing combined operation during charge-deplete and charge-sustain operation using the following utility factors except as specified in this paragraph (b):

TABLE 3 OF §600.116–12—MULTI-DAY INDIVIDUAL UTILITY FACTORS FOR URBAN "CITY" DRIVING

Schedule range for UDDS phases, miles	Equivalent 5-cycle distance, miles	Cumulative UF	Sequential UF
3.59	2.51	0.08	0.08
7.45	5.22	0.15	0.08
11.04	7.73	0.22	0.06
14.90	10.43	0.28	0.06
18.49	12.94	0.33	0.05
22.35	15.65	0.38	0.05
25.94	18.16	0.43	0.04
29.80	20.86	0.47	0.04
33.39	23.37	0.50	0.04
37.25	26.08	0.54	0.04
40.84	28.59	0.57	0.03
44.70	31.29	0.60	0.03
48.29	33.80	0.62	0.02
52.15	36.51	0.65	0.02
55.74	39.02	0.67	0.02
59.60	41.72	0.69	0.02
63.19	44.23	0.71	0.02
67.05	46.94	0.72	0.02
70.64	49.45	0.74	0.01
74.50	52.15	0.75	0.01
78.09	54.66	0.78	0.03
81.95	57.37	0.79	0.01
85.54	59.88	0.80	0.01
89.40	62.58	0.81	0.01
92.99	65.09	0.82	0.01

TABLE 4 OF §600.116–12—MULTI-DAY INDIVIDUAL UTILITY FACTORS FOR HIGHWAY DRIVING

Schedule range for HFET phases, miles	Equivalent 5-cycle distance, miles	Cumulative UF	Sequential UF
10.30	7.21	0.21	0.21

TABLE 4 OF § 600.116–12—MULTI-DAY INDIVIDUAL UTILITY FACTORS FOR HIGHWAY DRIVING—
Continued

Schedule range for HFET phases, miles	Equivalent 5-cycle distance, miles	Cumulative UF	Sequential UF
20.60	14.42	0.36	0.16
30.90	21.63	0.48	0.12
41.20	28.84	0.57	0.09
51.50	36.05	0.64	0.07
61.80	43.26	0.70	0.06
72.10	50.47	0.75	0.04
82.40	57.68	0.78	0.04
92.70	64.89	0.81	0.03
103.00	72.10	0.83	0.02
113.30	79.31	0.85	0.02

(3) You may calculate performance values under paragraphs (b)(1) and (2) of this section by combining phases during FTP testing. For example, you may treat the first 7.45 miles as a single phase by adding the individual utility factors for that portion of driving and assigning emission levels to the combined phase. Do this consistently throughout a test run.

(4) Instead of the utility factors specified in paragraphs (b)(1) and (2) of this section, calculate utility factors using the following equation for vehicles whose maximum speed is less than the maximum speed specified in the driving schedule, where the vehicle's maximum speed is determined, to the nearest 0.1 mph, from observing the highest speed over the first duty cycle (FTP, HFET, etc.):

$$UF_i = 1 - \left[\exp\left(-\sum_{j=1}^{k} \left(\left(\frac{d_i}{ND} \right)^j \times C_j \right) \right) \right] - \sum_{i=1}^{n} UF_{i-1}$$

Where:

UF_i = the utility factor for phase i. Let $UF_0 = 0$.

j = a counter to identify the appropriate term in the summation (with terms numbered consecutively).

k = the number of terms in the equation (see Table 3 of this section).

d_i = the distance driven in phase i.

ND = the normalized distance. Use 399 for both FTP and HFET operation.

C_j = the coefficient for term j from the following table:

TABLE 5 OF § 600.116–12—CITY/HIGHWAY SPECIFIC UTILITY FACTOR COEFFICIENTS

Coefficient	Fleet values for CAFE and GHG values		Multi-day individual value for labeling
	City	Highway	City or highway
1	14.86	4.8	13.1
2	2.965	13	−18.7
3	−84.05	−65	5.22

TABLE 5 OF § 600.116–12—CITY/HIGHWAY SPECIFIC UTILITY FACTOR COEFFICIENTS—Continued

Coefficient	Fleet values for CAFE and GHG values		Multi-day individual value for labeling
	City	Highway	City or highway
4	153.7	120	8.15
5	−43.59	−100.00	3.53
6	−96.94	31.00	−1.34
7	14.47		−4.01
8	91.70		−3.90
9	−46.36		−1.15
10			3.88

n = the number of test phases (or bag measurements) before the vehicle reaches the end-of-test criterion.

(5) The end-of-test criterion is based on a 1 percent Net Energy Change as

specified in Section 3.8. The Administrator may approve alternate Net Energy Change tolerances as specified in Section 3.9.1 or Appendix C if the 1 percent threshold is insufficient or inappropriate for marking the end of charge-deplete operation.

(6) Use the vehicle's Actual Charge-Depleting Range, R_{cda}, as specified in Section 6.1.3 for evaluating the end-of-test criterion.

(7) Measure and record AC watt-hours throughout the recharging procedure. Position the measurement appropriately to account for any losses in the charging system.

(8) We may approve alternate measurement procedures with respect to plug-in hybrid electric vehicles if they are necessary or appropriate for meeting the objectives of this part.

[76 FR 39548, July 6, 2011, as amended at 76 FR 57380, Sept. 15, 2011]

Subpart C—Procedures for Calculating Fuel Economy and Carbon-Related Exhaust Emission Values

§ 600.206–08 Calculation and use of FTP-based and HFET-based fuel economy values for vehicle configurations.

(a) Fuel economy values determined for each vehicle under § 600.113(a) and (b) and as approved in § 600.008–08 (c), are used to determine FTP-based city, HFET-based highway, and combined FTP/Highway-based fuel economy values for each vehicle configuration for which data are available.

(1) If only one set of FTP-based city and HFET-based highway fuel economy values is accepted for a vehicle configuration, these values, rounded to the nearest tenth of a mile per gallon, comprise the city and highway fuel economy values for that configuration.

(2) If more than one set of FTP-based city and HFET-based highway fuel economy values are accepted for a vehicle configuration:

(i) All data shall be grouped according to the subconfiguration for which the data were generated using sales projections supplied in accordance with § 600.208(a)(3).

(ii) Within each group of data, all values are harmonically averaged and rounded to the nearest 0.0001 of a mile per gallon in order to determine FTP-based city and HFET-based highway fuel economy values for each subconfiguration at which the vehicle configuration was tested.

(iii) All FTP-based city fuel economy values and all HFET-based highway fuel economy values calculated in paragraph (a)(2)(ii) of this section are (separately for city and highway) averaged in proportion to the sales fraction (rounded to the nearest 0.0001) within the vehicle configuration (as provided to the Administrator by the manufacturer) of vehicles of each tested subconfiguration. The resultant values, rounded to the nearest 0.0001 mile per gallon, are the FTP-based city and HFET-based highway fuel economy values for the vehicle configuration.

(3) For the purpose of determining average fuel economy under § 600.510–08, the combined fuel economy value for a vehicle configuration is calculated by harmonically averaging the FTP-based city and HFET-based highway fuel economy values, as determined in § 600.206(a)(1) or (2) of this section, weighted 0.55 and 0.45 respectively, and rounded to the nearest 0.0001 mile per gallon. A sample of this calculation appears in appendix II of this part.

(4) For alcohol dual fuel automobiles and natural gas dual fuel automobiles the procedures of paragraphs (a)(1) or (2) of this section, as applicable, shall be used to calculate two separate sets of FTP-based city, HFET-based highway, and combined fuel economy values for each configuration.

(i) Calculate the city, highway, and combined fuel economy values from the tests performed using gasoline or diesel test fuel.

(ii) Calculate the city, highway, and combined fuel economy values from the tests performed using alcohol or natural gas test fuel.

(b) If only one equivalent petroleum-based fuel economy value exists for an electric configuration, that value, rounded to the nearest tenth of a mile per gallon, will comprise the petroleum-based fuel economy for that configuration.

(c) If more than one equivalent petroleum-based fuel economy value exists for an electric vehicle configuration,