



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NATIONAL VEHICLE AND FUEL EMISSIONS LABORATORY
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OFFICE OF AIR AND RADIATION

January 3, 2022

CD-2022-01 (LDV/LDT/ICI/LIMO)

SUBJECT: Fuel Economy Label Information for 2022 and 2023 Model Years

Dear Manufacturer:

The purpose of this manufacturer information letter is to provide information designed to guide you in your 2022 and 2023 model year fuel economy labeling program.

Enclosure 1, "Fuel Economy Supplementary Information for the 2023 Model Year," contains information necessary to print fuel economy labels, including information about 2023 fuel costs, fuel economy ranges, smog and fuel economy ratings, and more. Except for the fuel economy ranges described in section 2 of Enclosure 1, nothing in this document impacts labels for 2022 model year vehicles. Labels for 2022 model year vehicles should continue to use the fuel prices and ratings information specified in [CD-2020-20](#) (December 28, 2020). All 2023 model year labels should use the information specified in this guidance letter.

Enclosure 2, "Determining Fuel Economy and Greenhouse Gas Ratings for the 2023 Model Year," details the calculations used to determine the fuel economy and greenhouse gas ratings to be used for all 2023 model year vehicles.

If you have any questions about these instructions, please contact your certification team representative.

Sincerely,

A handwritten signature in black ink, appearing to read "Byron Bunker".

Byron Bunker, Director
Compliance Division
Office of Transportation and Air Quality

Enclosures

cc: Mike Laughlin, DOE

Enclosure 1 to CD-2022-01
Fuel Economy Supplementary Information for the 2023 Model Year

1. Annual Fuel Cost Estimates for 2023 Model Year Vehicles

Annual fuel cost estimates used on the fuel economy labels of 2023 model year vehicles must be based on the following fuel cost estimates. You should contact your EPA representative if you need a fuel price for a fuel not listed below.

Regular Unleaded Gasoline	\$2.95	per gallon
Mid-Grade Unleaded Gasoline	\$3.40	per gallon
Premium Unleaded Gasoline	\$3.65	per gallon
Diesel Fuel	\$3.20	per gallon
E85	\$2.60	per gallon
CNG	\$2.15	per gallon equivalent
Electricity	\$0.14	per kilowatt-hour

The annual fuel cost estimates should be calculated based on 15,000 annual vehicle miles, the above listed fuel cost and the adjusted combined MPG (0.55/0.45 harmonic weighting of the adjusted city and highway MPG values, then rounded to the nearest whole MPG). Note that the annual fuel cost is required to be rounded to the nearest \$50. The generally accepted method for achieving this is to divide the unrounded annual fuel cost by 50, round the result to the nearest \$1 (using ASTM rounding), and then multiply by 50. Using this method, an unrounded value that ends in exactly 25 will be rounded down, and an unrounded value that ends in exactly 75 will be rounded up (e.g., \$1225 rounds to \$1200 and \$1275 rounds to \$1300). Fuel prices shown here are applicable only to 2023 model year vehicles and should not be applied to any 2022 model year vehicles.

2. Fuel Economy Ranges to be placed on FE Labels for 2022 and 2023 Model Year Vehicles

Labels must contain the range of the highest and lowest combined MPG values of vehicles within each vehicle class, commonly called the “fuel economy range” for a comparable class of vehicles. Pursuant to 40 CFR 600.314-08(d), EPA provided the combined MPG ranges for comparable classes of vehicles via EPA guidance letter CD-2020-20 (December 28, 2020). The ranges in that guidance were generally applicable to the 2022 model year, as well as to any 2021 model year vehicles manufactured more than 15 days after that guidance letter was published. This guidance letter updates those ranges and should be used for both 2023 model year vehicles as well as any 2022 model year vehicles manufactured more than 15 days after the publication date of this guidance letter (ref. 40 CFR 600.301).

If, in the course of the model year, manufacturers add a model with MPG values outside the ranges provided in the EPA guidance letter, manufacturers should update the ranges for that model appropriately, increasing or decreasing the range as needed. Because these ranges are based on 2022 models, EPA may provide updated ranges during the 2023 model year.

Car Line Class	Estimated Fuel Economy Range
	(MPG)* Combined (55% city/45% highway)
Two Seaters	9 - 30
Minicompact Cars	14 - 32
Subcompact Cars	15 - 110
Compact Cars	18 - 79
Midsize Cars	15 - 132
Large Cars	14 - 131
Small Station Wagons	25 - 120
Midsize Station Wagons	14 - 117
Large Station Wagons	0 - 0
Small Pick-up Trucks	17 - 26
Standard Pick-up Trucks	12 - 70
Vans	16 - 17
Special Purpose Vehicle	15 - 28
Minivans	20 - 48
Small Sport Utility Vehicles	14 - 129
Standard Sport Utility Vehicles	14 - 102

* Note that ranges do not include the MPG values of FFVs while operating on E85.

3. Fuel Economy and Greenhouse Gas Ratings for 2023 Model Year Vehicles

The label requires a “slider bar” that displays MPG and greenhouse gas (GHG) ratings. The ratings for the 2023 model year were determined according to the methodology described in the regulations (see Enclosure 2) and should apply to all 2023 model year vehicles, even those labeled after EPA issues new ratings for the 2024 model year. In other words, all 2023 models will be rated using the same system, presented in this guidance, to ensure comparability across all 2023 models.

All vehicles require an MPG rating determined from the table below. The regulations require that gasoline vehicles display a single rating, based on the rounded combined MPG, as determined for model year 2023 vehicles in the table below. Gasoline vehicles are not required to display a separate GHG rating. Flexible fuel (E85) vehicles are rated based on gasoline operation and, like gasoline vehicles, require only a single rating based on gasoline operation. The MPG value to be used to determine a rating for plug-in hybrid electric vehicles is a combined city/highway “utilitized” MPG value (i.e., a weighted combination of the charge-depleting MPGe and the charge-sustaining MPG).

Model Year 2023 Rating Scale for Fuel Economy	
Fuel Economy Rating	Combined City/Highway Fuel Economy (MPG)
10	≥72
9	52 - 71
8	41 - 51
7	34 - 40
6	28 - 33
5	22 - 27
4	18 - 21
3	16 - 17
2	14 - 15
1	≤13

Under the regulations, manufacturers must calculate a combined city/highway CO₂ value, both for display on the label (for all vehicles) and to calculate a GHG rating (for certain vehicles that operate on fuels other than gasoline). Note that the combined city/highway CO₂ is determined just like the comparable MPG value, i.e., it is a sales-weighted model type value determined from sub-configuration test results, not a mathematical conversion of the model type MPG value. It is determined in the same way the MPG value is, using the derived 5-cycle, modified 5-cycle, or full 5-cycle methodology. The CO₂ value to be used to determine a rating for plug-in hybrid electric vehicles is a combined city/highway “utilitized” gram per mile value (i.e., a weighted combination of the charge-depleting CO₂ emissions and the charge-sustaining CO₂ emissions).

Vehicles that operate on fuels other than gasoline (including plug-in hybrid electric vehicles) must determine a GHG rating from the following table. (Gasoline-E85 flexible fuel vehicles should establish a GHG rating on each fuel, although for labeling purposes these vehicles receive MPG and GHG ratings as if they were gasoline vehicles. The GHG rating on E85 should not be placed on the label.) If the numerical GHG rating determined from this table is identical to the numerical fuel economy rating, then the label should display only one “pointer” above the slider bar. If the GHG rating differs from the fuel economy rating (as will be the case, for example, for some diesel and CNG vehicles) then the label should display two pointers on the slider. The pointer above the slider bar should represent the fuel economy rating, and the pointer below the slider bar should represent the GHG rating.

Model Year 2023 Rating Scale for Greenhouse Gases	
Greenhouse Gas Rating	Combined City/Highway CO₂ g/mile
10	0 - 124
9	125 - 173
8	174 - 219
7	220 - 265
6	266 - 323
5	324 - 413
4	414 - 508
3	509 - 573
2	574 - 658
1	≥659

These ratings were determined according to the methodology described in the regulations. The specific methodology is described in Enclosure 2.

4. Average New Vehicle Fuel Economy and Cost Values

The new label requires a comparison of estimated five-year fuel costs for the labeled vehicle to the estimated five-year fuel costs for the average new vehicle. In addition, the fuel economy and five-year estimated fuel cost of the average vehicle are reported in the fine print of the label. Per the regulations, the five-year fuel cost for the average new vehicle is based on regular unleaded gasoline cost and 15,000 miles per year, rounded to the nearest \$50. Thus, for the 2023 model year, based on the regular unleaded gasoline price projection in this memorandum, the statement in the label footer should read as follows:

“The average new vehicle gets 28 MPG and costs \$8,000 to fuel over 5 years.”

5. Smog Rating

Criteria for establishing smog ratings are now generally contained in the regulations (see 40 CFR 600.311-12(g)). However, for consistency with previous guidance and to provide a single resource for label ratings, we reproduce the smog rating scale for model year 2023 below.¹ As with previous guidance, the rating for a vehicle will continue to be based on the federal emission standards to which a vehicle is certified. When we established the Tier 3 emission standards for motor vehicles, we included regulations for smog ratings that reflect the new standards, including the transitional period during which the new standards are phased in. However, the regulatory action left open the question of how to rate a TZEV – a vehicle category established by the California Air Resources Board (ARB) in the context of their ZEV program.² Some commenters on the Tier 3 rulemaking asked that EPA develop appropriate ratings that account for both the exhaust certification and all-electric range of TZEVs. We responded that EPA

¹ The ratings table below replicates Table 2 in 40 CFR 600.311-12(g).

² See 79 FR 23592, April 28, 2014.

planned to include smog ratings for TZEVs in the annual fuel economy guidance letter and therefore were not finalizing a smog rating for California TZEVs in the Tier 3 rulemaking.

We have determined that a TZEV is a vehicle category established for the sole purpose of the California ZEV program, and that its purpose in that program is to credit TZEVs (which are expected to be mostly plug-in hybrid electric vehicles) for their partial operation on electricity. There are no provisions currently in EPA label regulations to factor electric range into the smog rating, and as such, the rating for TZEVs – as for all other vehicles – are based on the standards to which they are certified. Thus, there is no specific TZEV entry in the smog ratings table. The table in the regulations that describes ratings for 2023 model year vehicles will continue to apply. TZEVs will get a rating of 7 or 8, depending upon the standards to which they are certified. EPA may consider a ratings system that accounts for the all-electric range of plug-in hybrid electric vehicles in future revisions to the fuel economy labeling provisions.

Rating	U.S. EPA Tier 3 Emission Standard	U.S. EPA Tier 2 Emission Standard	California Air Resources Board LEV III Emission Standard
1	Bin 160	Bin 5 through Bin 8	LEV160
2			
3	Bin 125, Bin 110	Bin 4	ULEV125
4			
5	Bin 85, Bin 70	Bin 3	ULEV70
6	Bin 50		ULEV50
7	Bin 30	Bin 2	SULEV30
8	Bin 20		SULEV20
9			
10	Bin 0	Bin 1	ZEV

6. Quick Response (QR) Code

Please note that successful implementation of the QR Code requires more frequent updating of the online database at www.fueleconomy.gov. Given this, it is unlikely that data entered by manufacturers will be subject to the degree of quality checking by EPA that manufacturers may have become accustomed to. It is imperative that manufacturers adopt a greater responsibility in ensuring the accuracy and completeness of their data when they enter it.

Paragraph 600.302-12(b)(6) requires that the label contain a QR Code. A QR Code is a two-dimensional bar code that contains text – in this case a website URL. The regulations note that EPA will specify the URL that should be encoded in the QR Code.

In consultation with DOE, we have identified a methodology for determining the URL for a given model type. Using this methodology, every model type will have a unique URL assigned to it, allowing mobile devices to access the data for that specific model type. The URL should have the following form:

<http://fueleconomy.gov/qr?id=YYYYMMMXXX>

Where:

YYYY = the four digit model year of the model type (e.g., 2023);

MMM = the three character manufacturer code as entered in EPA's Verify database, in all capitals (e.g., TKX); and

XXX = the model type index as entered in EPA's Verify database, where all values are represented by 3 digits using preceding zeros as necessary (e.g., 123, 073, 004).

7. Label Text Regarding the Best Overall Vehicle

The label requires two statements regarding the best overall vehicle – one regarding MPG and another, in a different location on the label, regarding CO₂ grams/mile performance. Similar to how we treat the fuel economy ranges of comparable vehicles, we typically ask the manufacturer to refer to the guidance from the prior model year until updated guidance is published. For 2023 model year vehicles the following statements should appear in the designated places on the label:

“The best vehicle rates 132 MPGe.”

“The best emits 0 grams per mile (tailpipe only).”

8. Expressing the All-Electric Driving Range of a Blended Plug-In Hybrid Electric Vehicle

To ensure that the all-electric driving range of a “blended” plug-in hybrid electric vehicle (PHEV) is accurately characterized by the manufacturer on the label, we request that the all-electric range (if any) be expressed as a range of values. (A blended PHEV is a PHEV that mixes gasoline use with stored electricity from the grid before the grid electricity is fully depleted.) For example, instead of describing the range as “12 miles”, the label should state the range as “0 to 12 miles” or “0-12 miles” (replace “0” with an appropriate non-zero value if a non-zero value accurately describes the real-world operation of the vehicle).

We have found that use of the derived 5-cycle method (with a limit on the adjustment of 0.7) may not be an accurate method for characterizing some of the performance values of some vehicles. For example, aggressive driving such as that found on the US06 may immediately call upon the internal combustion engine of a PHEV, thus reducing the all-electric range not by 30%, but by 100%, i.e., to zero miles. Because the label values are intended to account for the effects of aggressive driving, air conditioning use, cold temperatures, and other factors, the label should attempt to describe the real-world effects of these factors on the all-electric driving range of a PHEV. These factors, either singly or in combination, can significantly reduce or even eliminate the all-electric driving range of a PHEV. Consequently, we request that manufacturers describe the all-electric range of a PHEV as a range with a lower bound that is zero, unless the manufacturer can justify, with an engineering analysis or test results, that a non-zero value is appropriate (i.e., that a non-zero all-electric range will occur even when aggressive driving, air conditioning, cold temperatures, and other real-world factors are encountered in actual use).

Enclosure 2 to CD-2022-01
Determining Fuel Economy and Greenhouse Gas Ratings for the 2023 Model Year

Model type data from the 2022 model year (i.e., the Fuel Economy Guide data) as available in early December of 2021 was used to determine the ratings for the 2023 model year as follows.

Step 1: Determine the midpoint of the rating scale

The regulations specify the methodology by which the midpoint of the rating scale (the point between the ratings of 5 and 6) is determined.³

EPA published midpoint values for the 2012-2025 model years in this guidance in previous years, most recently in EPA guidance letter CD-16-18 (December 5, 2016). Those values were based on the estimated average achieved fuel economy values under the footprint-based Corporate Average Fuel Economy (CAFE) standards.⁴ We used the fleet-wide (cars and trucks combined) projected CAFE values for the purpose of determining the previously-published values. However, those fleet-wide values were based on projections of car and light truck sales, and their relative market shares, that have shifted since the rulemaking was published. Cars have been declining in market share, and trucks increasing, since the 2013 model year. Further, the previously published projections for vehicle footprint and for air conditioning and off-cycle credits also differed from what EPA saw in the 2017-2019 model year data. These trends have caused the previously-published midpoint value projections to likely be too high.

In this guidance for prior model years, EPA has indicated that the midpoint values could be adjusted to use updated projections as may be appropriate for a given year. Thus, we first revised our methodology for the 2019 model year and used a consistent methodology for the 2020 model year by basing the midpoint on the individual car and truck values. For MY 2021, we also updated the footprint and vehicle credit assumptions consistent with our most recent year of complete data.

For MY 2022 and MY 2023, EPA revised the methodology for determining the midpoint value by using updated tailpipe projections from the 2020 SAFE Rulemaking as a basis for analysis. These tailpipe projections are not influenced by credits and the market share assumptions for car compared to truck sales are somewhat recent. The analysis produces a midpoint value of 28 MPG. Thus, for the 2023 model year, the midpoint of the rating scale is the fuel consumption corresponding to 28 MPG, or 0.03571 gallons/mile. Additionally, 28 MPG serves as the value representing the average vehicle for the 2023 model year for the purpose of calculating the 5- year fuel cost of the average vehicle.

³ French, R. Memorandum to Docket No. EPA-HQ-OAR-2009-0865, "Adjusting Combined City/Highway CAFE Fleet Values to Determine Equivalent 5-Cycle Label Values." May 18, 2011.

⁴ 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, Final Rule, Federal Register 77 (15 October 2012): 62641, Table I-2.

Label Breakpoint Values Model Years 2012-2022	
2012	22
2013	23
2014	23
2015	24
2016	25
2017	26
2018	27
2019	27
2020	27
2021	27
2022	27
2023	28

Step 2: Determine the value defining a score of 10

Using the 2022 model type data, we determined the mean fuel consumption value (0.04263 gal/mi) and the standard deviation of the data (0.01440 gal/mi). The regulations specify that the mean minus two standard deviations will establish the fuel consumption value defining a rating of 10. Thus, the minimum MPG (rounded to the nearest whole mile per gallon) to receive a rating of 10 is:

$$MPG_{10} = \frac{1}{0.04263 - (2 \times 0.01440)} = 72 \text{ MPG}$$

Therefore, rounded combined MPG values greater than or equal to 72 receive a rating of 10.

Step 3: Determine the value defining a score of 1

As in Step 2, we use the mean fuel consumption value and the standard deviation of the latest model year model type data. The regulations specify that the mean plus two standard deviations establishes the fuel consumption value defining a rating of 1. To be consistent with how we established the rating of 10, this equation determines the minimum fuel consumption value to receive a rating of 2, where values less than this get a rating of 1. Thus, the minimum MPG (rounded to the nearest whole mile per gallon) to receive a rating of 2 is:

$$MPG_1 = \frac{1}{0.04263 + (2 \times 0.01440)} = 14 \text{ MPG}$$

Therefore, rounded combined MPG values less than 14 MPG receive a rating of 1.

Step 4: Establish the ratings from 6 to 9

Using the midpoint of the rating scale established in Step 1 (converted to fuel consumption) and the fuel consumption value defining a rating of 10 established in Step 2, we can then determine the intermediate ratings of 6 through 9. The regulations require that we divide this range into

equal fuel consumption intervals. Doing so results in the following divisions between ratings, shown in both consumption and rounded miles per gallon:

Rating	Lower limit (gal/mi)	Lower limit (MPG)	Upper limit (MPG)
10	0.01382	72	--
9	0.01935	52	71
8	0.02469	41	51
7	0.02985	34	40
6	0.03571	28	33

Step 5: Establish the ratings from 2 to 5

Using the midpoint of the rating scale established in Step 1 (converted to fuel consumption) and the fuel consumption value defining a rating of 1 established in Step 3, we can then determine the intermediate ratings of 2 through 5. The regulations require that we divide this range into equal fuel consumption intervals. Doing so results in the following divisions between ratings, shown in both consumption and rounded miles per gallon:

Rating	Lower limit (gal/mi)	Lower limit (MPG)	Upper limit (MPG)
5	0.04464	22	27
4	0.05438	18	21
3	0.06448	16	17
2	0.07144	14	15
1	0.00000	--	13

Step 6: Determine GHG ratings

The regulations specify that the GHG ratings will be determined from the MPG ratings using the conversion factor of 8887 grams of CO₂ per gallon of gasoline. Carrying out this operation on the values determined above yields the following complete set of fuel economy and greenhouse gas ratings for 2023 model year vehicles:

Rating	MPG		GHG	
	≥	≤	≥	≤
10	72	--	0	124
9	52	71	125	173
8	41	51	174	219
7	34	40	220	265
6	28	33	266	323
5	22	27	324	413
4	18	21	414	508
3	16	17	509	573
2	14	15	574	658
1	--	13	659	--