

Technical Support Memorandum

“Technology Innovation – Transforming the Automotive Market”

(EPA-420-F-12-077)

This memo provides technical support and further discussion of assumptions used in developing the analysis for the brochure, “Technology Innovation – Transforming the Automotive Market,” EPA-420-F-12-077 (available at www.epa.gov/nvfel/showcase.htm).

Data for All Figures

The data for this analysis were submitted to the Environmental Protection Agency (EPA) by manufacturers in compliance with the EPA greenhouse gas emissions standards, the Department of Transportation (DOT) Corporate Average Fuel Economy (CAFE) regulations and EPA/DOT fuel economy labeling regulations. The majority of this data is available publicly on the website www.fueleconomy.gov. Additional data sources, including manufacturer websites, were used for determining footprint data. Hyundai and Kia vehicles are included in this analysis. The specific Hyundai and Kia models that were relabeled in MY 2012 and MY 2013 were adjusted appropriately in this analysis. This analysis includes all vehicles for which vehicle labels were generated, and it should be noted that a few vehicles in this analysis have limited consumer availability (e.g., the Honda Clarity FCX and Mercedes-Benz F-cell fuel cell vehicles are only available to some consumers in selected California markets).

Figure 1

The fuel economy thresholds are combined city/highway ratings, calculated using a 55% city/45% highway harmonic weighting. Model year (MY) 2007 unadjusted city and highway fuel economy values were adjusted using the derived 5-cycle methodology in Appendix A of the CO₂ and Fuel Economy Trends Report (www.epa.gov/otaq/fetrends.htm). Combined miles per gallon (MPG) values for plug-in hybrid electric vehicles (PHEVs) are based on the combined composite MPGe value.

SUV, pickup, minivan, van, and car classifications are as used at fueleconomy.gov and in the 2012 Fuel Economy Guide.

Figure 1 (and Figures 2, 4, and 5) displays model “counts.” EPA’s goal here is to count those models which are generally marketed and perceived by consumers to be unique vehicle choices, but not to count multiple configurations which are generally marketed and perceived by consumers to be the same model. There is engineering judgment involved in applying this approach, and EPA made every effort to be consistent in doing so for the individual 2007 and 2012 model years. Some key guidelines are listed below:

- Vehicle configurations with the same name are generally (exceptions below) counted as one model (e.g., all Honda Civics are counted as one model). Vehicle options included as one model include:
 - Engine and transmission options (including hybrid, diesel, CNG, EV, and ECO variants)
 - 2WD and 4WD versions
 - Trim levels
 - Convertible, hatchback, and wagon body styles
 - FFV and non-FFV models
 - Vehicles with slightly different names that are substantially the same model
- The following examples are counted as separate models:
 - Identical vehicle “twins” from different divisions/brands
 - Mini Cooper was treated as three models (Mini Cooper, Mini Cooper Clubman, Mini Cooper Countryman), based on wheelbase, with multiple trim models within each wheelbase (that are not counted separately)
 - Prius, Prius v and Prius c are counted as distinct models
- If a model met thresholds defined in the analysis (e.g., fuel economy greater than 20 mpg), the model was counted only once, regardless of the number of variants that could meet the threshold.

Figure 2

The same guidelines for counting models as defined for Figure 1 above apply to Figure 2.

Definitions for alternative fuel and advanced technology designations are the same as those used on fueleconomy.gov and the 2012 Fuel Economy Guide.

If a model met thresholds in multiple categories (e.g., a Ford Focus is both a gasoline vehicle and an electric vehicle), the model was counted once in each category (even though the Focus is only counted as one compact car in Figure 1).

Figure 3

This is a conventional sales-weighted analysis similar to data presented in the annual CO₂ and Fuel Economy Trends reports. The MY 2007 data was reported in the 2011 Trends report. The MY 2012 data are preliminary values based on sales projections in MY 2012 label submissions to EPA.

Figure 4

The same guidelines for counting models as defined for Figure 1 above apply to Figure 4.

Figure 4 is based on the “current” vehicles available on dealer lots as of publication. These are mostly MY 2013 vehicles, with a smaller number of MY 2012 vehicles that have not yet been replaced by a MY

2013 vehicle in the market. Discontinued or replaced MY 2012 vehicles have been removed from the analysis.

Each vehicle’s CO₂ targets for future model years was determined based on the final footprint curves from the 2012-2016 and 2017-2025 GHG rulemakings. Footprint values for 2013 vehicles are based on technical data published on the manufacturer’s website and in some cases prior CAFE submissions.

Vehicle classifications are as used at fueleconomy.gov and in the 2012 Fuel Economy Guide.

For this analysis, EPA assumed that all vehicles in 2016-2025 receive maximum air conditioning credits. This allows us to project which vehicles can meet future standards without additional changes to the vehicle powertrain. EPA considers this a likely scenario since air conditioning credits are some of the least cost ways to reduce GHGs. Air conditioning credits were applied to cars and trucks according to the maximum credit available, as specified in the GHG rules:

Cars	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
A/C refrigerant		7.8	9.3	10.8	12.3	13.8	13.8	13.8	13.8	13.8
A/C efficiency		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Total	10	12.8	14.3	15.8	17.3	18.8	18.8	18.8	18.8	18.8
Trucks	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
A/C refrigerant		7.0	11.0	13.4	15.3	17.2	17.2	17.2	17.2	17.2
A/C efficiency		5.0	6.5	7.2	7.2	7.2	7.2	7.2	7.2	7.2
Total	10	12.0	17.5	20.6	22.5	24.4	24.4	24.4	24.4	24.4

Figure 5

The same guidelines for counting models as defined for Figure 1 above apply to Figure 5.

The same guidelines for the universe of vehicles, future CO₂ targets, and air conditioning credits as defined for Figure 4 above apply to Figure 5.

Technology designations as used on fueleconomy.gov and in the 2012 Fuel Economy Guide.

Figure 6

This is a conventional sales-weighted analysis similar to data presented in the annual CO₂ and Fuel Economy Trends reports. It is based on projected MY 2012 sales only, since EPA did not have access to a full data set for MY 2013.

The same guidelines for future CO₂ targets and air conditioning credits as defined for Figure 4 above apply to Figure 6.