NVFEL

Vehicle Technology Showcase

Technology Innovation

Transforming the Automotive Market

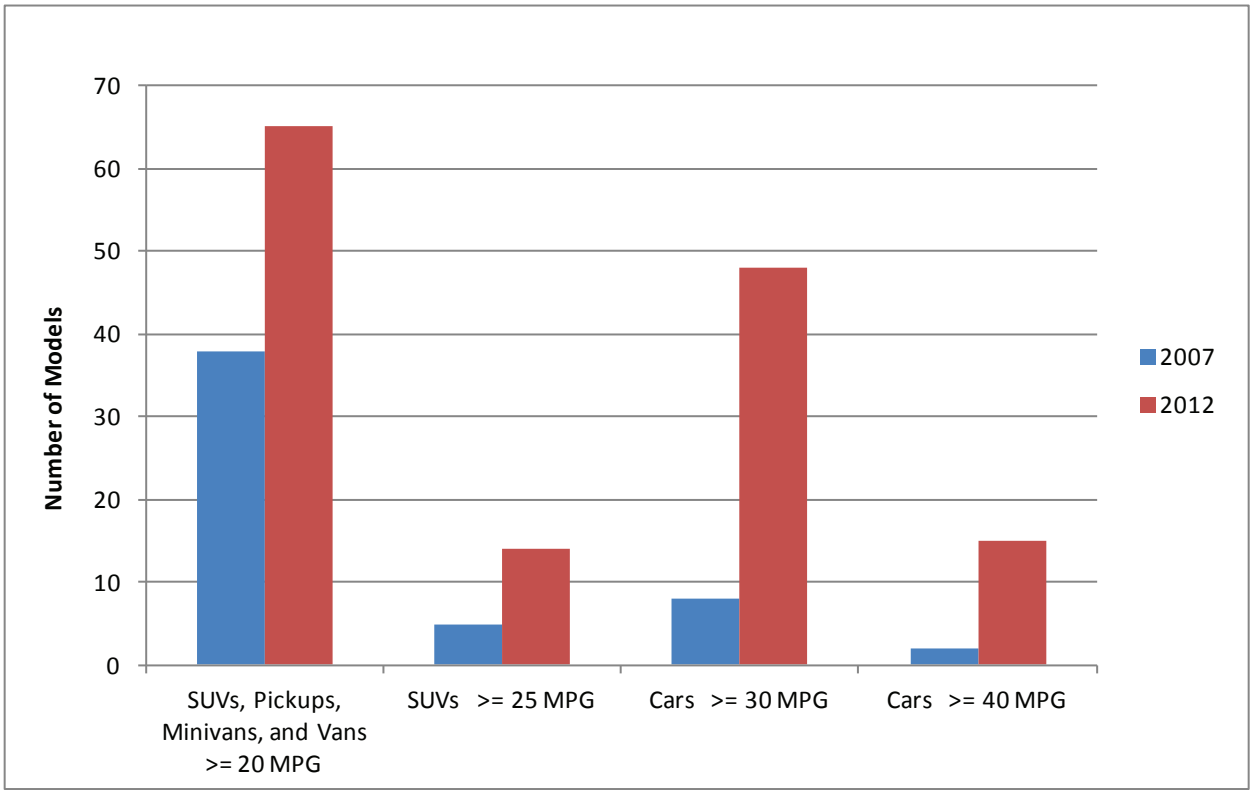
Technology Innovation

Consumers shopping for vehicles with better fuel economy and lower carbon emissions have a wider range of choices than ever, as automakers are increasingly introducing cars, minivans, sport utility vehicles (SUVs) and pickup trucks with advanced technologies and alternative fuels. While the number of hybrid and plug-in electric models increases every year, most of the improvement in fuel economy and carbon emissions is a result of the rapid commercialization of advanced gasoline vehicle technologies such as gasoline direct-injection engines, turbochargers, and advanced transmissions. These technologies are enabling many vehicles in showrooms today, with straightforward improvements to air conditioning systems, to already meet EPA's new carbon dioxide (CO_2) emissions targets years ahead of schedule. Consumers who buy these vehicles will not only get better mileage, but will also enjoy significant savings at the gas pump.

Consumers have an increasing number of high fuel economy vehicle choices

Consumers have more choices than ever when shopping for vehicles with higher fuel economy and lower carbon emissions. Buying these vehicles means more money in consumers' pocketbooks due to gasoline savings. Compared to just five years ago, the number of high miles per gallon (mpg) vehicle offerings has grown considerably – and across all segments, from cars to SUVs, pickups, minivans and vans (Figure 1).[1]

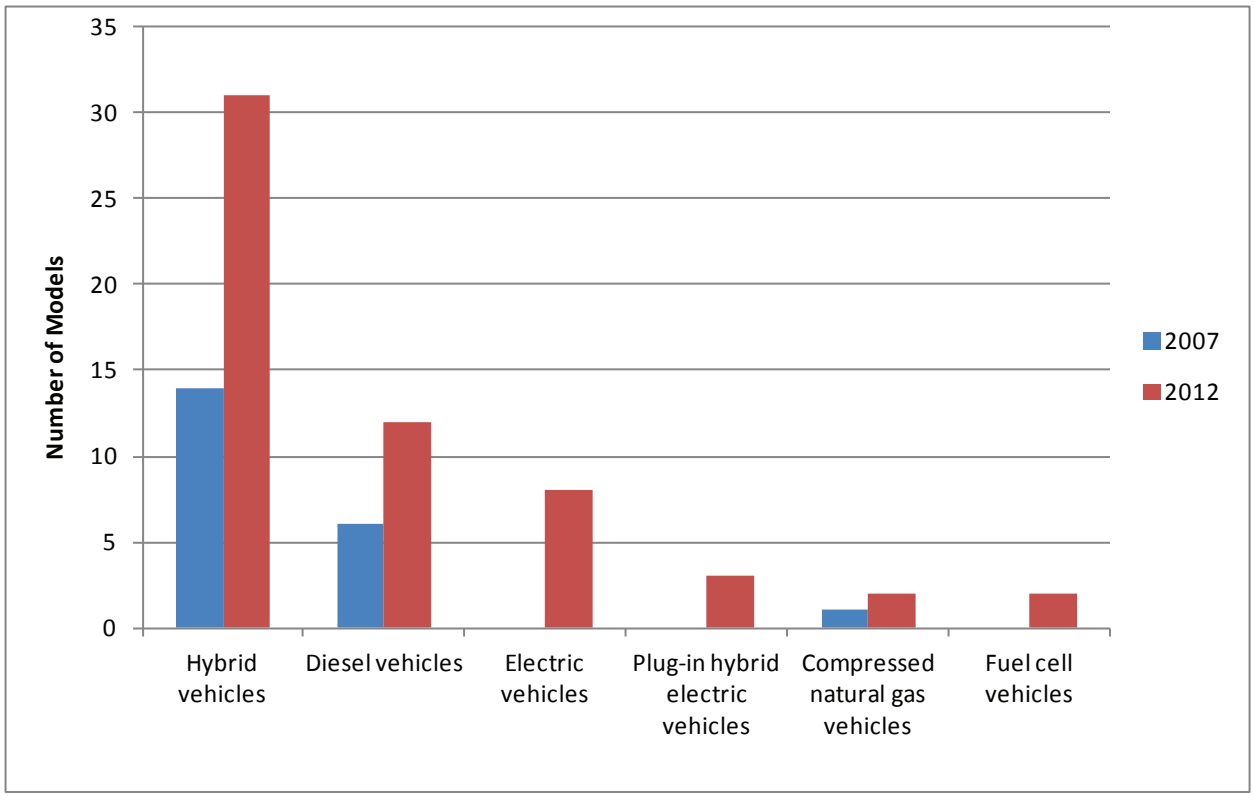
Figure 1.
Vehicle Models Meeting Fuel Economy Thresholds in 2007 and 2012[2]



There are now 65 models across SUVs, pickups, minivans and vans with combined city/highway label fuel economy ratings of 20 mpg or more, compared with 38 models five years ago, and 14 SUV models achieve 25 mpg or above.[3] There are now 48 car models available with a combined city/highway label fuel economy of 30 mpg or more, compared to just 8 in 2007, and 15 of these cars achieve 40 mpg or higher.

Consumers also have many more alternatives to conventional gasoline vehicles (Figure 2). Five years ago, the only advanced vehicle technology for which there were meaningful choices was hybrids, with a smaller number of diesels and one compressed natural gas vehicle. Today, not only are there twice as many hybrid and diesel offerings, but growing numbers of electric vehicles (EVs), plug-in hybrid electric vehicles (PHEVs), natural gas vehicles, and fuel cell vehicles as well. Hybrid vehicle offerings have increased from 14 in 2007 to 31 in 2012, and diesel offerings have increased from 6 in 2007 to 12 in 2012. Consumers shopping for alternative fueled vehicles can also choose from 8 EVs, 3 PHEVs, 2 natural gas vehicles, and 2 fuel cell vehicles.[4]

Figure 2.
Alternative Fueled and Advanced Technology Vehicle Models



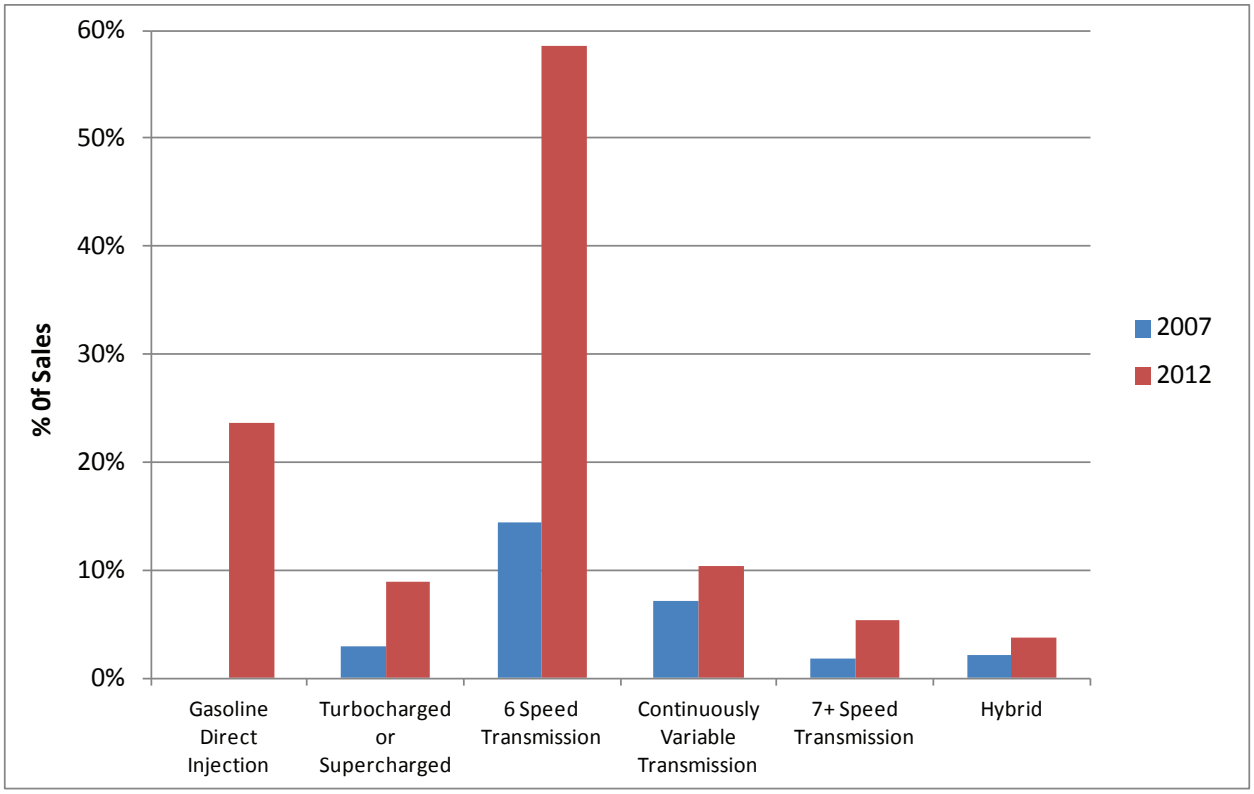
Advanced gasoline vehicle technologies are rapidly gaining market share

Technology innovation is a major driving force behind the recent improvements in CO_2 emissions and fuel economy. Automakers are continually introducing into the market new advancements in gasoline engine and transmission technology. Because gasoline vehicles still account for the vast majority of vehicle sales, these advanced gasoline technologies account for more fuel and carbon savings than all alternative fuel vehicles combined.

Conventional fuel injection systems are being replaced by more sophisticated gasoline direct injection systems, whose use has grown from essentially zero five years ago to 24% of the projected market in 2012 (Figure 3). The use of turbochargers/superchargers has tripled from about 3% in 2007 to a projected 9% in 2012. The market share for conventional hybrids has increased slightly since 2007.

Transmission technology advancements are particularly impressive. Six-speed, seven or higher-speed, and continuously variable transmissions are rapidly replacing the traditional four-speed transmission, now reaching a nearly 75% cumulative market share compared with 25% just five years ago.

Figure 3.
Advanced Gasoline Vehicle Technology Penetration

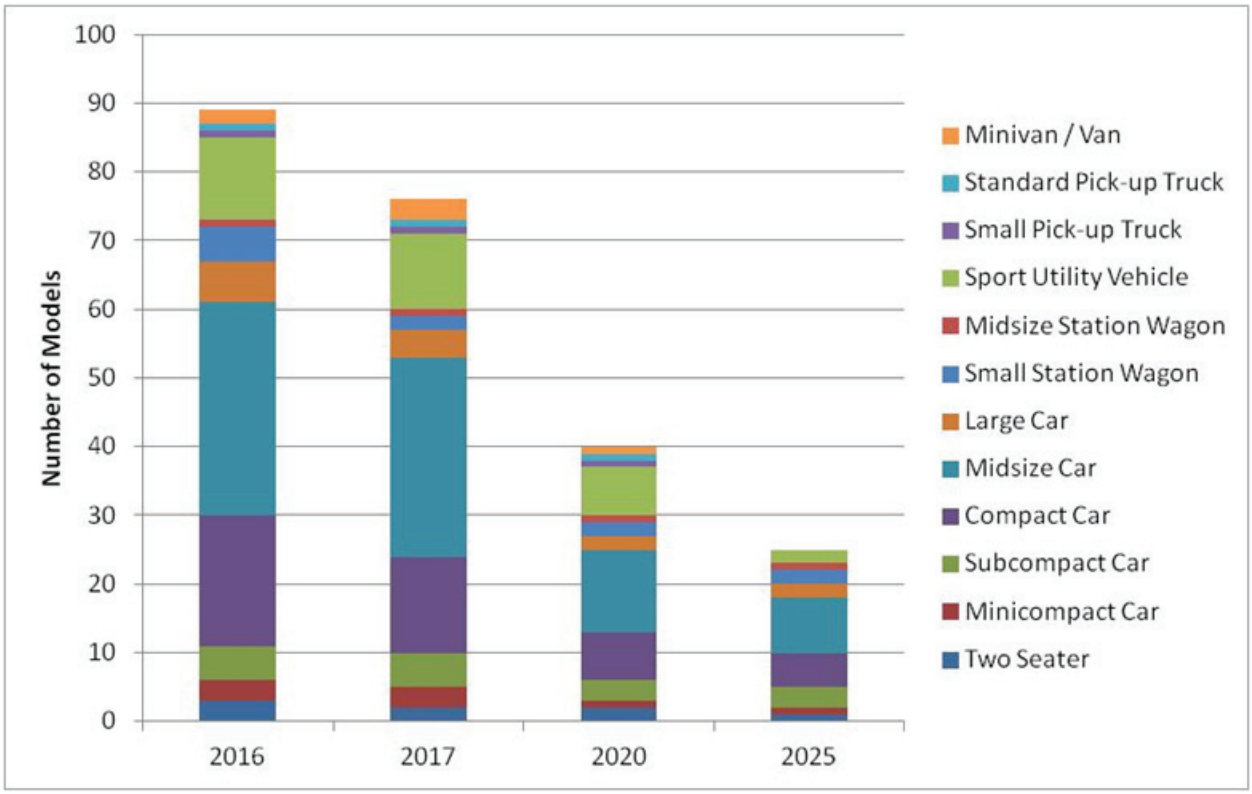


Automakers are selling many vehicles today that can meet future CO_2 targets

EPA's new emissions standards for light-duty vehicles are projected to result in an average industry fleet-wide compliance level of 163 grams/mile of CO_2 by 2025, or 54.5 mpg if achieved exclusively from fuel economy improvements. EPA's earlier standards for 2016 are projected to result in an average fleet-wide compliance level of 250 grams/mile CO_2, or 35.5 mpg if achieved exclusively from fuel economy. These CO_2 standards translate into average fleet-wide label values of about 28 mpg in 2016 and 40 mpg in 2025. The CO_2 targets vary by a vehicle's size, or "footprint," so automakers can continue offering consumers a full range of vehicle choices with the utility customers want.[5] EPA has done an assessment of how many vehicles already either meet the future CO_2 targets, or can meet them with straightforward improvements in air conditioning systems.

We evaluated current vehicle models[6] against future footprint-based CO_2 targets to determine which vehicles could meet or exceed the targets in model years 2016-2025, assuming the only additional changes manufacturers would make are improvements to the air conditioning efficiency and leakage systems (Figures 4, 5, 6). We assumed the addition of only air conditioning improvements since these are some of the least expensive technologies available to reduce CO_2 and other greenhouse gas emissions.[7]

Figure 4.
Currently Available Vehicle Models That Meet Future CO_2 Targets, by Vehicle Class



About 90 vehicles in showrooms today either already meet the 2016 CO_2 targets, or can meet these targets with the addition of expected air conditioning improvements. These vehicles span a wide range of vehicle segments, including cars, SUVs, minivans, and pickup trucks (Figure 4), and more than half are gasoline technology (Figure 5). Almost 25% of today's vehicle sales meet (or can meet with expected air conditioning changes) the 2016 CO_2 targets (Figure 6). Looking ahead, there are about 40 vehicles (5% of today's sales) that can meet the 2020 CO_2 targets, and about 25 vehicles (3% of today's sales) that can meet the 2025 CO_2 targets. While gasoline vehicles make up more than half of the vehicles meeting the 2016 targets, the vehicles meeting the 2025 targets include only hybrids, plug-in hybrids, electric vehicles, and fuel cell vehicles. However, since the 2025 standards are more than 10 years away, there's considerable time for continued improvements in gasoline vehicle technology.

Figure 5.
Currently Available Vehicle Models That Meet Future CO_2 Targets, by Technology

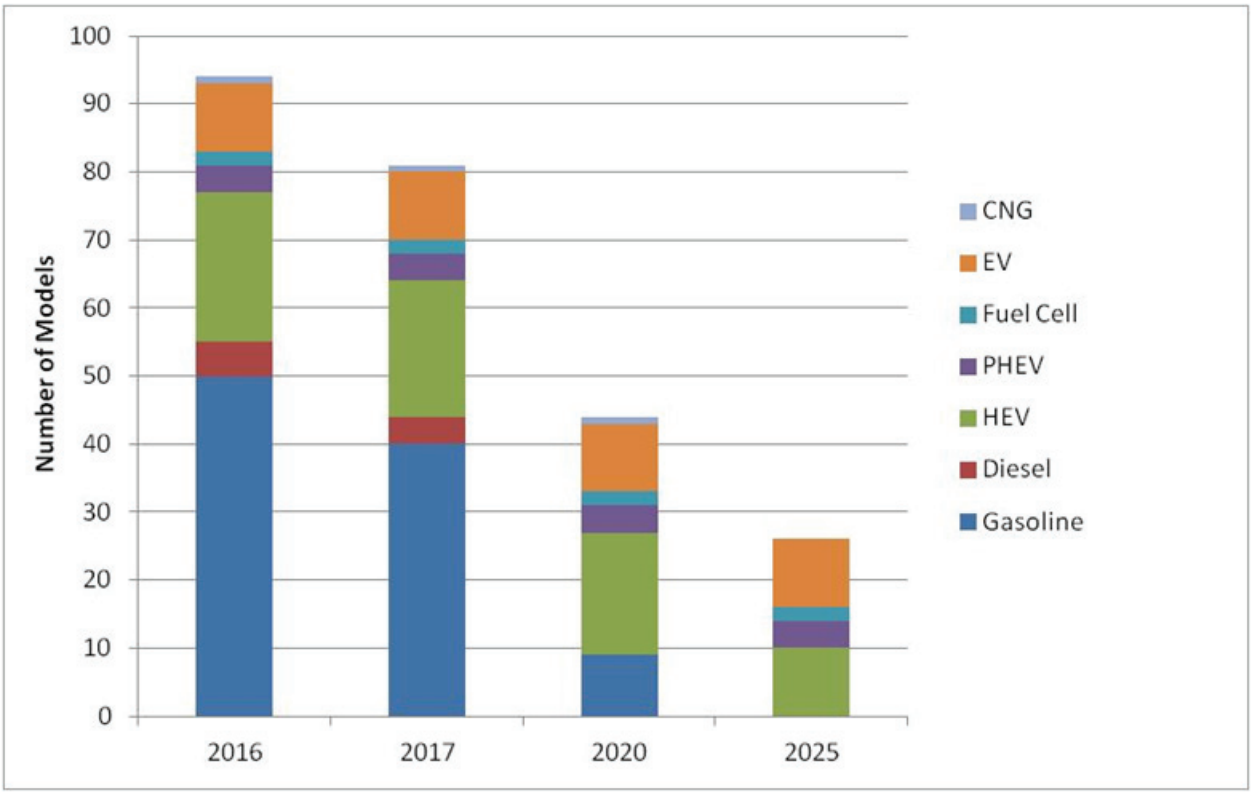
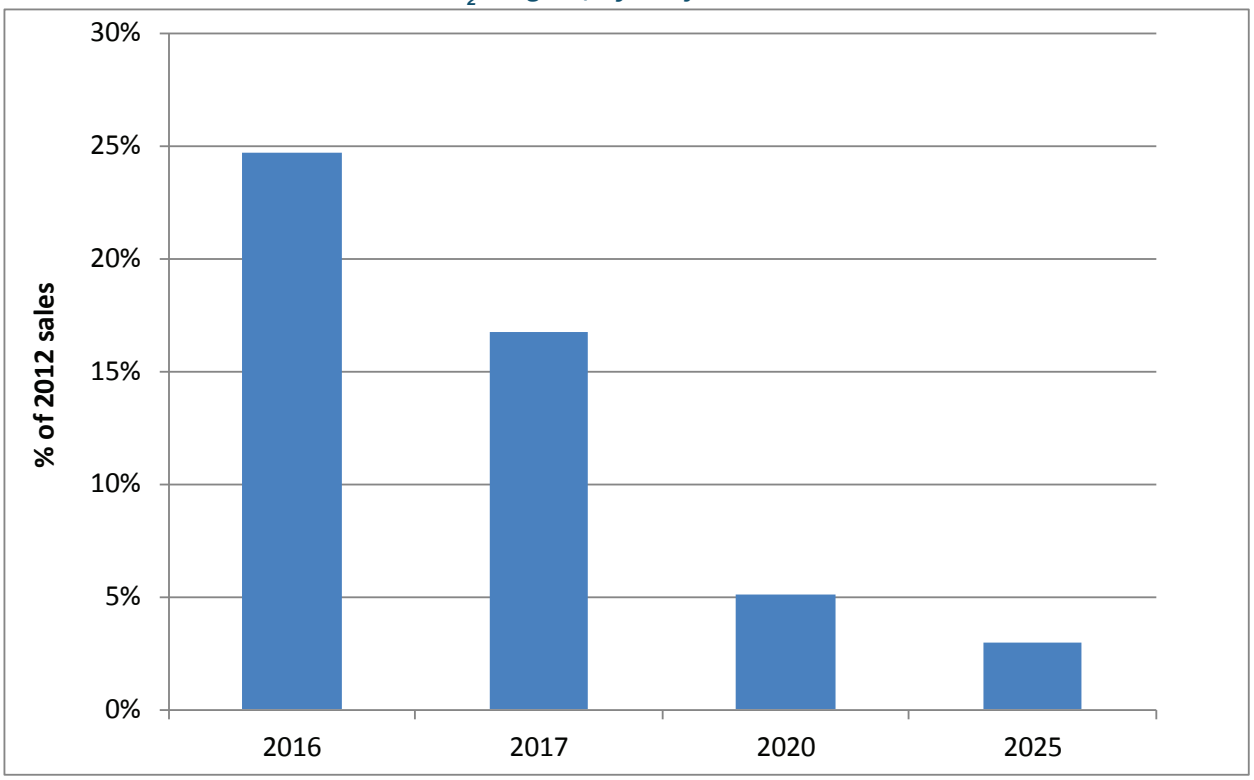


Figure 6.
2012 Vehicles That Meet Future CO_2 Targets, by Projected Sales



1 In this analysis, EPA had to make judgments about how to group vehicle models for the most meaningful comparison between model year (MY) 2007 and 2012 vehicles. EPA prepared a technical support memo documenting the assumptions and methodology that went into all the analyses contained in this brochure, available at www.epa.gov/nvfel/showcase.htm.

2 All years referenced in this document are model years.

3 The fuel economy metric for all non-petroleum fueled vehicles is miles per gallon of gasoline equivalent.

4 Some alternative fueled vehicles have limited consumer availability; for example, the Honda FCX Clarity and Mercedes-Benz F-Cell fuel cell vehicles are only available to some consumers in selected California markets.

5 Note that the EPA CO_2 standards are part of the National Program for reducing greenhouse gas emissions and improving fuel economy. The National Program includes both the EPA CO_2 standards and the Corporate Average Fuel Economy (CAFE) standards established by the Department of Transportation's National Highway Traffic Safety Administration.

6 This current vehicle model data included mostly MY 2013 data, but we used MY 2012 data for models where MY 2013 data was not yet available.

7 While we assessed individual vehicle models compared to their footprint-based CO_2 targets for purposes of this analysis, it is important to note that no individual vehicle is actually required to achieve a specific CO_2 target. Instead, each manufacturer has a unique CO_2 compliance value for its car and truck fleets, based on the sales-weighted vehicles it produces in a given model year.

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