

## EPA and NHTSA Finalize Historic National Program to Reduce Greenhouse Gases and Improve Fuel Economy for Cars and Trucks

The U.S. Environmental Protection Agency (EPA) and the Department of Transportation's National Highway Traffic Safety Administration (NHTSA) are finalizing a joint rule to establish a national program consisting of new standards for model year 2012 through 2016 light-duty vehicles that will reduce greenhouse gas emissions and improve fuel economy. EPA is finalizing the first-ever national greenhouse gas (GHG) emissions standards under the Clean Air Act, and NHTSA is finalizing Corporate Average Fuel Economy (CAFE) standards under the Energy Policy and Conservation Act.

The new standards apply to new passenger cars, light-duty trucks, and medium-duty passenger vehicles, covering model years 2012 through 2016. The EPA GHG standards require these vehicles to meet an estimated combined average emissions level of 250 grams of carbon dioxide (CO<sub>2</sub>) per mile in model year 2016, equivalent to 35.5 miles per gallon (mpg) if the automotive industry were to meet this CO<sub>2</sub> level all through fuel economy improvements.

These final rules were developed in response to President Obama's call for a strong and coordinated federal greenhouse gas and fuel economy program.<sup>1</sup> At the same time, the national program allows automobile manufacturers to build a single light-duty national fleet that satisfies all requirements under both Federal programs and the standards of the State of California and other states that have adopted the California standards. The national program therefore provides critical nationwide environmental and energy benefits while ensuring that consumers have a full range of vehicle choices.

## **Need to Reduce Greenhouse Gas (GHG) Emissions and Improve Fuel Economy from Passenger Cars and Light Trucks**

The rules will simultaneously reduce greenhouse gas emissions, improve energy security, increase fuel savings, and provide clarity and predictability for manufacturers.

Climate change is one of the most significant long-term threats to public health and the global environment. It is caused by an excess of greenhouse gases in the atmosphere which effectively trap some of the Earth's heat that would otherwise escape into space. Greenhouse gases are both naturally occurring and anthropogenic. Greenhouse gases emitted as a result of human activities include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

The key effects of climate change observed to date and projected to occur in the future include, but are not limited to, more frequent and intense heat waves, more severe wildfires, degraded air quality, heavier and more frequent downpours and flooding, increased drought, greater sea level rise, more intense storms, harm to water resources, continued ocean acidification, harm to agriculture, and harm to wildlife and ecosystems.

Improving energy security by reducing our dependence on oil has been a national objective since the first oil price shocks in the 1970s. Tight global oil markets led to prices over \$100 per barrel in 2008, with gasoline reaching as high as \$4 per gallon in many parts of the U.S., causing financial hardship for many families. The light-duty vehicles subject to this national program account for about 40 percent of all U.S. oil consumption.

Mobile sources emitted 31 percent of all U.S. GHG emissions in 2007 (transportation sources, which do not include certain off-highway sources, account for 28 percent) and have been the fastest-growing source of U.S. GHG emissions since 1990.<sup>1</sup> Mobile sources addressed in the recent endangerment and contribution findings under CAA section 202(a)--light-duty vehicles, heavy-duty trucks, buses, and motorcycles--accounted for 23 percent of all U.S. GHG in 2007.<sup>2</sup> Light-duty vehicles emit four GHGs--CO<sub>2</sub>, methane, nitrous oxide, and hydrofluorocarbons--and are responsible for nearly 60 percent of all mobile source GHGs and over 70 percent of Section 202(a) mobile source GHGs. For light-duty vehicles in 2007, CO<sub>2</sub> emissions represent about 94 percent of total greenhouse emissions (including HFCs), and the CO<sub>2</sub> emissions measured by EPA fuel economy compliance tests represent about 90 percent of all greenhouse gas emissions.<sup>3,4</sup>

### **Benefits and Costs of the National Program**

Over the lifetime of the vehicles sold during 2012-2016, this national program is projected to reduce U.S. greenhouse gas emissions by 960 million metric tons and save 1.8 billion barrels of oil. In total, the combined EPA and NHTSA 2012-2016 standards will reduce GHG emissions from the U.S. light-duty fleet by approximately 21 percent by 2030 over the level that would occur in the absence of the national program.

EPA estimates that the lifetime cost of 2012-2016 model year vehicles under the national program are less than \$52 billion, well below the expected benefits, which are expected to be approximately \$240 billion. The monetized benefits include the effects of the program on fuel savings, CO<sub>2</sub> reductions, particulate matter (PM<sub>2.5</sub>) benefits, improved energy security, and other impacts such as the value of less frequent refueling, the value of increased driving, and the monetized impact of increased traffic congestion, motor vehicle crashes, and noise. There are also potential impacts of the rule that are not quantified and monetized in the model year analysis, including the health and environmental impacts associated with changes in ambient exposures to toxic air pollutants and ozone, and the benefits associated with avoided non-CO<sub>2</sub> GHGs (methane, nitrous oxide, HFCs). The national program is comprised of the two agencies' standards, and this discussion of costs and benefits of EPA's GHG standards does not change the fact that both the CAFE and greenhouse gas standards, jointly, are the source of the majority of the program's benefits and costs.

## Benefits to Consumers

Together, EPA and NHTSA estimate that the average cost increase for a model year 2016 vehicle due to the national program will be approximately \$950. U.S. consumers who pay for their vehicle in cash will save enough in lower fuel costs over the first three years, on average, to offset these higher vehicle costs. However, most US consumers purchase a new vehicle using credit rather than paying cash. Consumers using an average 5-year, 60-month loan would see immediate savings due to their vehicle's lower fuel consumption in the form of reduced annual costs of \$130-\$180 a year throughout the duration of the loan (that is, the fuel savings will outweigh the increase in loan payments by \$130-\$180 per year).

Whether a consumer takes out a loan or pays for their vehicle in cash, consumers would save more than \$3,000 over the lifetime of a model year 2016 vehicle (that is, the \$4,000 saved on fuel easily offsets the increased cost of the vehicle). To calculate these fuel savings, fuel prices (including taxes) were estimated to range from \$2.61/gallon in 2012, to \$3.60/gallon in 2030, to \$4.49/gallon in 2050, based on Department of Energy projections.

## EPA's Standards

EPA is finalizing a set of fleet-wide average carbon dioxide (CO<sub>2</sub>) emission standards for cars and trucks. These standards are based on CO<sub>2</sub> emissions-footprint curves, where each vehicle has a different CO<sub>2</sub> emissions compliance target depending on its footprint value (related to the size of the vehicle). Generally, the larger the vehicle footprint, the higher the corresponding vehicle CO<sub>2</sub> emissions target. As a result, the burden of compliance is distributed across all vehicles and all manufacturers. Manufacturers are not compelled to build light vehicles of any particular size or type, and each manufacturer will have its own fleet-wide standard which reflects the vehicles it chooses to produce.

Table 1 shows the projected fleet-wide CO<sub>2</sub> emission level requirements under the footprint-based approach. The car requirements are projected to increase in stringency from 263 to 225 grams per mile between model year 2012 and model year 2016. Similarly, fleet-wide CO<sub>2</sub> emission

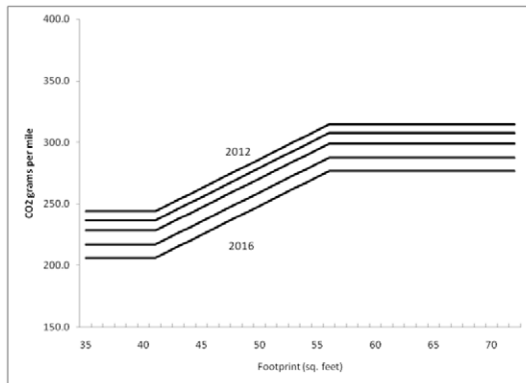
level requirements for trucks are projected to increase in stringency from 346 to 298 grams per mile. EPA projects that the average light vehicle (combined car and truck) tailpipe CO<sub>2</sub> compliance level in model year 2012 will be 295 grams per mile while the average vehicle tailpipe CO<sub>2</sub> emissions compliance level for the model year 2016 standard is projected to be 250 grams per mile, corresponding to 35.5 mpg in model year 2016, if all reductions were made through fuel economy improvements.

**Table 1 - Projected Fleet-Wide Emissions Compliance Levels under the Footprint-Based CO<sub>2</sub> Standards (g/mi) and Corresponding Fuel Economy (mpg)**

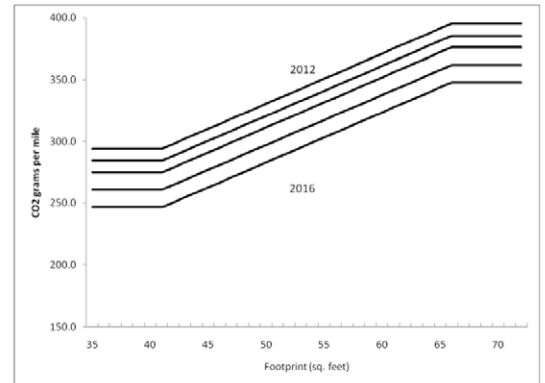
	2012	2013	2014	2015	2016
Passenger Cars (g/mi)	263	256	247	236	225
Light Trucks (g/mi)	346	337	326	312	298
Combined Cars & Trucks (g/mi)	295	286	276	263	250
Passenger Cars (mpg)	33.8	34.7	36.0	37.7	39.5
Light Trucks (mpg)	25.7	26.4	27.3	28.5	29.8
Combined Cars & Trucks (mpg)	30.1	31.1	32.2	33.8	35.5

Figures 1 and 2 show the actual footprint curves for cars and trucks. It is important to note that for the car standard curves shown in Figure 1 most model year 2012 - 2016 vehicle footprints are between 40-55 square feet. For the truck standard curves in Figure 2 most model year 2012 - 2016 truck footprints are between 45-65 square feet. Example footprint targets for popular vehicle models are shown in Table 2, illustrating the fact that different vehicle sizes will have varying CO<sub>2</sub> emissions and fuel economy targets under the footprint-based standards. Vehicle CO<sub>2</sub> emissions will be measured over the EPA city and highway tests.

**Figure 1 – CO<sub>2</sub> (g/mi) Car Standard Curves**



**Figure 2 – CO<sub>2</sub> (g/mi) Truck Standard Curves**



<b>Table 2 - Model Year 2016 CO<sub>2</sub> and Fuel Economy Targets for Various Model Year 2008 Vehicle Types</b>				
Vehicle Type	Example Models	Example Model Footprint (sq. ft.)	EPA CO <sub>2</sub> Emissions Target (g/mi)	NHTSA Fuel Economy Target (mpg)
<b>Example Passenger Cars</b>				
Compact car	Honda Fit	40	206	41.1
Midsized car	Ford Fusion	46	230	37.1
Full-size car	Chrysler 300	53	263	32.6
<b>Example Light-duty Trucks</b>				
Small SUV	4WD Ford Escape	44	259	32.9
Midsized crossover	Nissan Murano	49	279	30.6
Minivan	Toyota Sienna	55	303	28.2
Large pickup truck	Chevy Silverado	67	348	24.7

EPA is allowing auto manufacturers to earn credits toward the fleet-wide average CO<sub>2</sub> standards for improving air conditioning systems, such as reducing both hydrofluorocarbon (HFC) refrigerant losses (i.e. system leakage) and indirect CO<sub>2</sub> emissions related to the increased load on the engine. Earning credits for these types of greenhouse gas reductions is conditioned on demonstrated improvements in vehicle air conditioner systems, including both efficiency and refrigerant leakage improvement. Other program flexibilities, such as flex-fuel vehicle credits, temporary lead-time allowance, and advanced technology credits, will also be available to qualified auto manufacturers and are explained more fully below.

EPA's and NHTSA's technology assessment indicates there is a wide range of technologies available for manufacturers to use when upgrading vehicles to reduce greenhouse gas emissions and improve fuel economy. These include engine improvements, such as use of gasoline direct injection and downsized engines that use turbochargers to provide performance similar to that of larger engines, the use of advanced transmissions, increased use of start-stop technology, improvements in tire performance, reductions in vehicle weight, increased use of hybrid and other advanced technologies, and the initial commercialization of electric vehicles and plug-in hybrids. EPA is also projecting improvements in vehicle air conditioners including more efficient as well as low leak systems. All of these technologies are already available today, and EPA's and NHTSA's assessment is that manufacturers would be able to meet the standards through more widespread use of these technologies across their fleet.

EPA is also setting standards to cap tailpipe nitrous oxide (N<sub>2</sub>O) and methane (CH<sub>4</sub>) emissions at 0.010 and 0.030 grams per mile, respectively. Even after adjusting for the higher relative global warming potencies of these two compounds, nitrous oxide and methane emissions represent less than one percent of overall vehicle greenhouse gas emissions from new vehicles.

## EPA's Program Flexibilities

EPA's and NHTSA's programs provide compliance flexibility to manufacturers, especially in the early years of the national program. This flexibility is expected to provide sufficient lead time for manufacturers to make necessary technological improvements and reduce the overall cost of the program, without compromising overall environmental and fuel economy objectives.

EPA is establishing a system of averaging, banking, and trading (ABT) of credits integral to the fleet averaging approach, based on a manufacturer's fleet average CO<sub>2</sub> performance. This approach would allow credit trading among all vehicles a manufacturer produces, both cars and light trucks. Credit trading between companies will also be permitted. This program is similar to ABT programs EPA has established in other programs for motor vehicles. EPA is also including credits for improved air conditioning performance (both reduced leakage of refrigerant and improved air conditioner efficiency).

EPA is also finalizing several additional credit provisions. These include credits based on the use of advanced technologies, and generation of credits for superior greenhouse gas emission reduction performance prior to model year 2012. These credit programs will provide flexibility to manufacturers, which may be especially important during the early transition years of the program. In addition, both NHTSA and EPA are continuing to offer credits for vehicles designed to operate on alternative fuels, although these credits will no longer be available after model year 2015 under the EPA greenhouse gas program.

*Flex-fuel and Alternative Fuel Vehicle Credits* - EPA is allowing Flex Fuel Vehicle or FFV credits in line with limits established under the Energy Independence and Security Act of 2007 during model years 2012 to 2015. After model year 2015, EPA will determine alternative fuel vehicle emission values based on a vehicle's actual emissions while operating on gasoline as well as on the alternative fuel and a demonstration of actual alternative fuel use. FFVs are vehicles that can run both on an alternative fuel and conventional fuel. Most FFVs are E-85 capable vehicles, which can run on either gasoline or a mixture of up to 85 percent ethanol and 15 percent gasoline. Dedicated alternative fuel vehicles are vehicles that run exclusively on an alternative fuel.

*Optional Temporary Lead-time Allowance Alternative Standards (TLAAS)* - Manufacturers with limited product lines that have traditionally paid fines to NHTSA in lieu of meeting Corporate Average Fuel Economy (CAFE) standards may find it especially challenging to comply with the greenhouse gas emission standards. Under the Clean Air Act, manufacturers of light duty motor vehicles cannot pay fines in lieu of complying with motor vehicle emissions standards. However, EPA is finalizing an optional, temporary alternative standard provision, which is less stringent, to provide these manufacturers sufficient lead time to meet the tougher model year 2016 greenhouse gas standards, while preserving consumer choice of vehicles during this time.

There are two different groups of manufacturers to which this temporary standard applies. Manufacturers that produce between 50,000 and 400,000 model year 2009 vehicles in the U.S. would be allowed to establish a separate averaging fleet comprising on average 25,000 vehicles per year (and no more than 100,000 total vehicles during this four

year period). This separate, limited vehicle fleet would be subject to a less stringent greenhouse gas standard of 125 percent of the vehicle's otherwise applicable foot-print target level. The separate fleet could not generate credits for use by the remainder of the manufacturer's fleet. Because of their more limited product lines and higher baseline CO<sub>2</sub> emissions compared with other TLAAS manufacturers, manufacturers producing less than 50,000 model year 2009 vehicles in the U.S. would be allowed to place up to 200,000 vehicles in the TLAAS program between model years 2012-2015 and an additional 50,000 vehicles in model year 2016. The manufacturers would need to demonstrate that they have attempted to purchase credits from other manufacturers in order to comply with the base TLAAS program, but that sufficient credits were not available.

In model year 2016 (or 2017 for manufacturers below 50,000 vehicle sales), the TLAAS option ends, and all manufacturers, regardless of size, must comply with the same CO<sub>2</sub> standards, while under the CAFE program companies would continue to be allowed to pay civil penalties in lieu of complying with the CAFE standards. However, because companies must meet both the CAFE standards and the EPA CO<sub>2</sub> standards, the national program in effect means that companies will not have the civil penalty option, thereby resulting in more fuel savings and CO<sub>2</sub> reductions than would be the case under the CAFE program alone.

Manufacturers selling fewer than 5,000 vehicles in the U.S. will be deferred from this rulemaking. These manufacturers have extremely limited vehicle product lines across which to average, have typically paid fines under the CAFE program due to the very high CO<sub>2</sub> emissions of their vehicles, and need additional lead time to bring their vehicles into compliance with the GHG standards. EPA plans to set CO<sub>2</sub> standards for these smallest manufacturers through a separate rulemaking to be completed in the next 18 months. EPA estimates that small volume manufacturers comprise less than 0.1 percent of the total light-duty vehicle sales in the U.S., thus the deferment will have a very small impact on the GHG emission reductions from this rule.

*Advanced Technology Credits* - EPA is finalizing a temporary incentive program to encourage the early commercialization of advanced greenhouse gas/fuel economy control technologies, such as electric vehicles, plug-in hybrid electric vehicles, and fuel cell vehicles. In this program, manufacturers who produce advanced technology vehicles will be able to assign a zero gram per mile CO<sub>2</sub> emissions value to the first 200,000 vehicles sold in model years 2012-2016 (for PHEVs, the zero gram per mile value applies only to the percentage of miles driven on grid electricity), or 300,000 vehicles for manufacturers that sell 25,000 vehicles or more in model year 2012. The CO<sub>2</sub> emissions compliance levels for advanced technology vehicles sold beyond these cumulative vehicle production caps will account for the net increase in upstream CO<sub>2</sub> emissions relative to a comparable gasoline vehicle. EPA will reassess the issue of how to address advanced technology vehicle emissions in future rulemakings for MY2017 and beyond, based on the status of their commercialization, upstream GHG control programs, and other factors.

*Off-Cycle Innovative Technology Credits* - EPA is finalizing a credit opportunity for new and innovative technologies that reduce vehicle CO<sub>2</sub> emissions, but whose CO<sub>2</sub> reduction benefits are not captured over the 2-cycle test procedure used to determine compliance

with the fleet average standards (i.e., “off-cycle”). Eligible innovative technologies include those that are used in one or more current vehicle models, but that are not yet in widespread use in the light-duty fleet. Further, any credits for these off-cycle technologies must be based on real-world greenhouse gas emission reductions not captured on the current 2-cycle tests and verified by test methods that represent average U.S. driving conditions.

*Early Credits* - EPA is finalizing a program to allow manufacturers to generate early credits in model years 2009-2011. Credits may be generated through early additional fleet average CO<sub>2</sub> reductions, early A/C system improvements, early advanced technology vehicle credits, and early off-cycle credits. As with other credits, early credits are subject to a five year carry-forward limit based on the model year in which they are generated. Manufacturers may transfer early credits between vehicle categories (e.g., between the car and truck fleet). With the exception of model year 2009 early program credits, a manufacturer may trade other early credits to other manufacturers without limits. CAFE credits earned in model years prior to model year 2011 will still be available to manufacturers for use in the CAFE program in accordance with applicable regulations.

## Background on EPA’s Final Rule

EPA’s final rule represents the second phase of its response to the Supreme Court’s 2007 decision in *Massachusetts v. EPA*, which held that greenhouse gases were air pollutants for purposes of the Clean Air Act (CAA). The Court held that the Administrator must determine whether or not emissions of greenhouse gases from new motor vehicles and new motor vehicle engines cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare, or whether the science is too uncertain for EPA to make a reasoned decision. The Court remanded the case back to the Agency for reconsideration in light of its holding. The Administrator has responded to the Court’s remand by issuing two findings under section 202(a) of the Clean Air Act.<sup>5</sup> First, the Administrator found that the current and projected concentrations of the six key well-mixed greenhouse gases -- carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF<sub>6</sub>) -- in the atmosphere threaten the public health and welfare of current and future generations. This is referred to as the endangerment finding. Second, the Administrator found that the combined emissions of these well-mixed greenhouse gases from new motor vehicle and new motor vehicle engines contribute to the greenhouse gas pollution which threatens public health and welfare. This is referred to as the cause or contribute finding. New motor vehicles and engines emit carbon dioxide, methane, nitrous oxide, and hydrofluorocarbons.

Specifically, the Administrator found, after a thorough examination of the scientific evidence on the causes and impact of current and future climate change, and careful review of public comments, that the science compellingly supports a positive finding that atmospheric concentrations of these greenhouse gases result in air pollution which may reasonably be anticipated to endanger both public health and welfare.



## For More Information

You can access the rule and related documents on EPA's Office of Transportation and Air Quality (OTAQ) Web site at:

[www.epa.gov/otaq/climate/regulations.htm](http://www.epa.gov/otaq/climate/regulations.htm)

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<sup>1</sup>U.S. Environmental Protection Agency. 2009. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2007. EPA 430-R-09-004. Available at:  
[http://epa.gov/climatechange/emissions/downloads09/GHG2007entire\\_report-508.pdf](http://epa.gov/climatechange/emissions/downloads09/GHG2007entire_report-508.pdf)

<sup>2</sup>U.S. EPA. 2009 Technical Support Document for Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act. Washington, DC. pp. 180-194. Available at:  
<http://epa.gov/climatechange/endangerment/downloads/Endangerment%20TSD.pdf>

<sup>3</sup>U.S. Environmental Protection Agency. 2009. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2007. EPA 430-R-09-004. Available at:  
[http://epa.gov/climatechange/emissions/downloads09/GHG2007entire\\_report-508.pdf](http://epa.gov/climatechange/emissions/downloads09/GHG2007entire_report-508.pdf)

<sup>4</sup>U.S. Environmental Protection Agency. Regulatory Impact Analysis, Chapter 2. EPA-420-R-09-xxx. Available at:  
<http://www.epa.gov/otaq/climate/regulations.htm>

<sup>5</sup>See 74 FR 66496 (Dec. 15, 2009) for Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act