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April 9, 2010

THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

U.S. Light-Duty Vehicle GHG and CAFE Standards

Final Rule Summary

On April 1, 2010, U.S. Environmental Protection Agency (EPA) and U.S. Department of Transportation (DOT) finalized their new joint regulations for greenhouse gas (GHG) emissions and fuel economy for model year 2012-16 light duty vehicles. These regulations are in response to the May 19th 2009 announcement by President Obama to develop a rulemaking to reduce GHG emissions to 250 g/mile,[1] with a corresponding increase to fuel economy levels, for passenger vehicles by model year 2016. This action reflects a groundbreaking agreement between the U.S. government, the State of California, and the auto manufacturers on a unified national program to regulate automobile GHG emissions and fuel economy. As part of this announcement, EPA granted a waiver to California to implement its GHG standard for model year 2009-2011 vehicles and California agreed to forego enforcement of its GHG standards for 2012-2016 vehicles, in place of the new federal program.

The final rule provisions are largely unchanged from the proposed rule issued on September 15, 2009. Significant revisions are noted in the text, below.

Key Elements of the Program

Pollutants. The U.S. EPA will regulate GHG emissions from passenger vehicles up to 8,500-lb gross vehicle weight rating (plus medium-duty SUVs and passenger vans up to 10,000 pounds). The program sets standards for CO_2 emissions on the U.S. federal test procedure, which is weighted by 55% city driving and 45% highway driving. Equivalent Corporate Average Fuel Economy (CAFE) regulations, measured in miles per gallon of fuel consumed, are simultaneously established by the U.S. DOT National Highway Traffic and Safety Administration (NHTSA). There are additional provisions for the non-CO_2 GHG emissions of hydofluorocarbons (HFCs) from vehicle air conditioning systems and per-vehicle emission caps set for nitrous oxide (N_2O) and methane (CH_4) emissions. EPA did not consider the global warming potential of other emissions (e.g., black carbon).

Stringency. The average light duty vehicle GHG emission rate would be reduced from the average model year 2009[2] level of 337 gCO_2e/mile to 250 gCO_2e/mile for model year 2016, a 26% reduction, with interim standards for

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1 This is equivalent to 155 g CO_2/km on the U.S. test cycle, and this corresponds approximately to 172 g CO_2/km as measured on the New European Driving Cycle (NEDC).

2 The Final Rule updated the baseline from the 2008 model year to 2009.

2012-2015. Fuel economy is estimated to increase from an average model year 2009 level of 26.4 miles per gallon to 34.1 miles per gallon, for a 29% increase by model year 2016. Annually, this would be a 4.2% reduction per model year in the average GHG emissions, and 3.7% increase per model year in miles-per-gallon fuel economy.

Regulatory design. The standards use a vehicle size-based standard for two vehicle categories, following the current NHTSA fuel economy standard framework. The program sets separate numerical standards for vehicle size or "footprint" (i.e., the area defined by the wheelbase and average track width) for passenger cars and for light trucks. Differing from previous federal design of an S-shaped constrained logistical curve, the new system uses "piecewise linear" functions[3] between vehicle footprint and the test-cycle GHG emission rate. This general shape allows for different sized vehicles to have different standards in the sloped portion, but constrains the largest vehicles at the upper bend and incentivizes vehicles below the lower bend. The changes in the Final Rule from the proposal are slight.

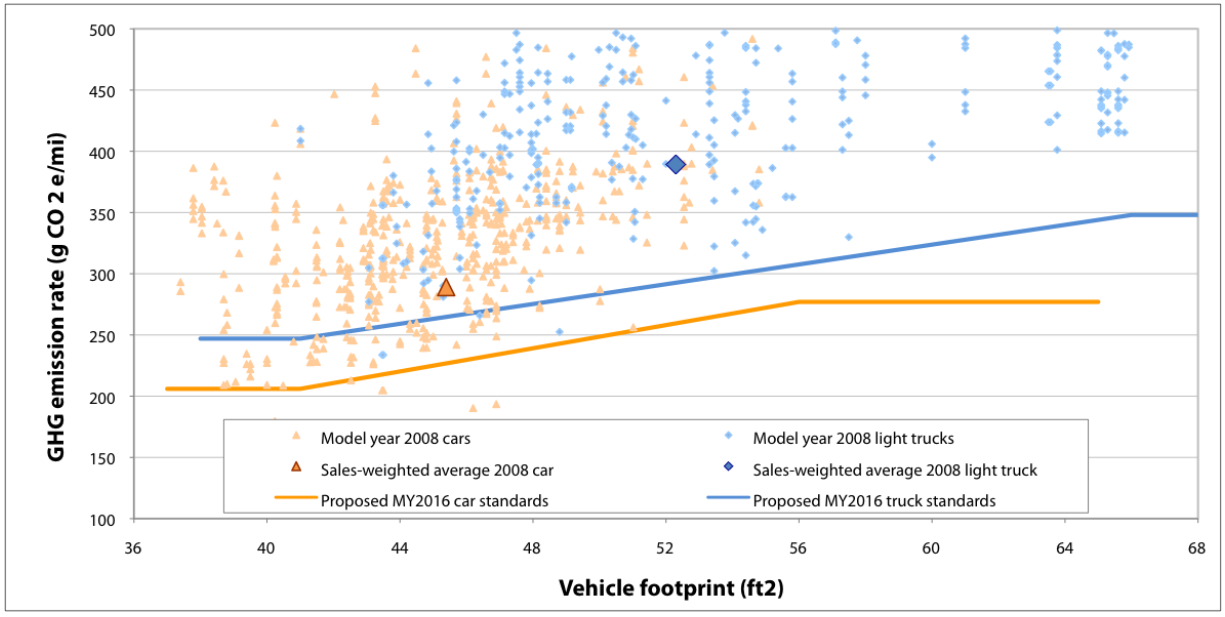

Figure 1. Proposed U.S. GHG standards, compared with model year 2008 light duty vehicles.

Because there are two categories, car and truck, and the standards are based on the footprint attributes of future year vehicle sales, the exact GHG and fuel economy outcome from the program is somewhat unknown and subject to the sales mix of vehicles sold in 2016. Figure 1 shows the sales-weighted average model year 2008 vehicles and the proposed model year 2016 standard.

Note that the footprint-based system means that selling more small vehicles does not necessarily help manufacturers meet the standards. Smaller vehicles are subject to more stringent requirements, such that a manufacturer of smaller vehicles has a lower CO_2 standard while a

3 The standards are defined by the function $GHG_{target} = Min\ (Max\ (c \cdot x + d, a), b)$, where a and b are the minimum and maximum gCO_2/mi values, c is the slope, d is the y-intercept, and x is the vehicle footprint in ft^2

manufacturer of larger vehicles has a higher CO_2 standard. Footprint systems encourage improvements in efficiency, regardless of vehicles size, and have relatively little impact on vehicle size mix. Unlike a weight-based standard, a footprint-based standard encourages use of lightweight materials while maintaining the vehicle size, without subjecting the manufacturers to a higher CO_2 requirement.

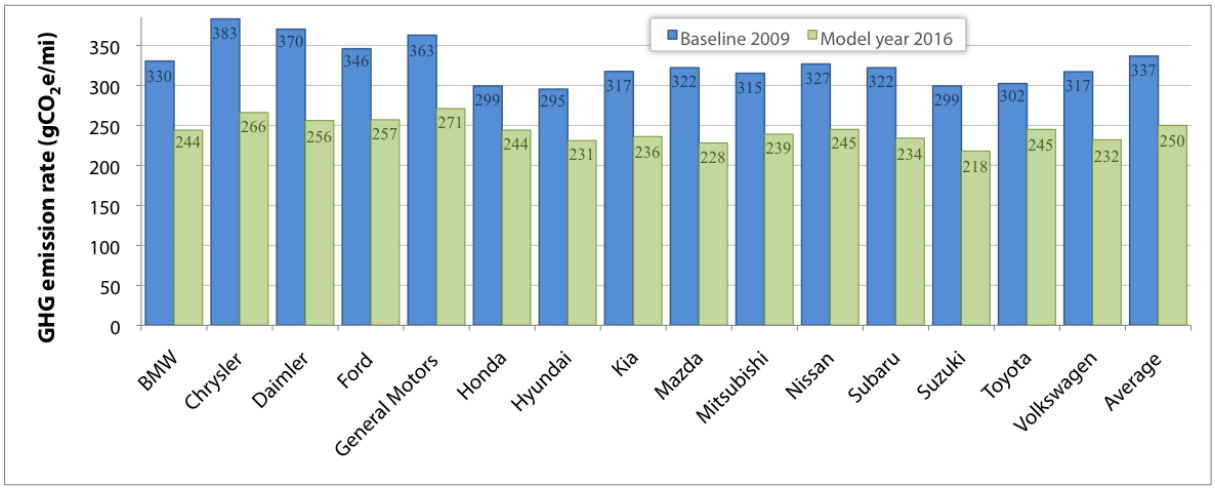

Figure 2. Manufacturer specific reductions to achieve model year 2016 GHG standards.

Each auto manufacturer will ultimately have a different footprint-based standard for 2012 to 2016 based on its sales mix of vehicles at each vehicle size. Based on automakers model year 2008 sales, baseline GHG emission rates (and fuel economy), and vehicle footprint attributes, the different automaker-specific reductions are shown in Figure 2.

Other provisions

The main compliance mechanism of the standard is fuel efficiency of vehicles. Emission reduction compliance credits can also be achieved via several other mechanisms, including, early compliance in 2009-2011, air conditioning system technology, flexible fuel vehicle deployment, and off-cycle technologies.

Early credits. For model years 2009-2011, emission reductions for over-compliance with either the existing federal CAFE standards or with the California GHG standards can be accrued and utilized within five years. The Final Rule prohibits trading of 2009 credits to other firms.

Air conditioning technologies. Technologies for more efficient air conditioning (e.g., externally controlled variable displacement systems) can be credited with up to 5.7 gCO_2e/mile; low-leak refrigerant systems technologies could be credited at up to 7.8 gCO_2e/mile; and alternative refrigerants with lower global warming potential (e.g., HLO-1234yf) could be credited at up to 17.2 gCO_2e/mile.

Flexible fuel vehicles (FFVs). The deployment of E85 vehicles, capable of running on up to 85% ethanol by volume (and the rest gasoline), can be credited through model year 2015 consistent with the similar current provisions. These credits will have maximum FFV credit values of about 10 gCO_2e/mile for passenger cars and 18 gCO_2e/mile for light trucks in year 2013, and these limits would be decreased through year 2015. From model year 2016 on, E85 and other flexible fuel vehicles are to be credited based strictly on the use of the alternative fuel via a method that is not yet determined.

Advanced technology vehicle. Advanced technology vehicles are to be credited at 0 g CO_2e/mile for their use of electricity and hydrogen. Examples of such technologies include full battery electric vehicles, hydrogen fuel cell electric vehicles, and plug-in hybrid electric vehicles (for the percentage of mileage estimated to be utilizing electricity for primary power). The Final Rule limited the 0 g CO_2e/mile credit to the first 200,000 (300,000 if more than 25,000 advanced technology vehicles are produced in 2012) vehicles produced during 2012-16 per manufacturer. Production above these caps would include calculated upstream CO_2e emission values. The Final Rule also removed the bonus multiplier credits, which counted each advanced technology vehicle as up to two vehicles.

Credit transfer, trading, carry-forward, carry-back. As previous, compliance obligations can be carried forward or backward for up to five years to manage year-by-year compliance credits and debits. Continuing from model year 2011, regulated automakers will be able to transfer credits between their passenger car and light truck compliance obligations, and they will be able to sell or trade credits to other automakers or purchase credits from other automakers to make up for compliance debits.

Low-volume manufacturer provisions. Lower volume manufacturers (i.e., less than 400,000 sales per year) are provided with temporary lead-time allowance alternative standards (TLAAS), whereby manufacturers would receive up to a 25% less stringent standard for up to 100,000 vehicles total spread over model years 2012-2015. The Final Rule extended this provision to 250,000 vehicles total spread over 2012-2016 for manufacturers with between 5,000-50,000 sales per year and deferred setting standards for manufacturers with less than 5,000 sales per year to a future rulemaking.

Compliance enforcement. Historically, manufacturers have had the option of paying fines in lieu of compliance with federal fuel economy regulations. It is unclear if or how the GHG standards will allow for continuance of this practice.

Estimated impacts in automobile market. The standards are estimated to cost consumers on average $948 per vehicle ($869 per car and $1,098 per truck) in model year 2016, for a total cost of $51.5 billion for model year 2012 to 2016 vehicles, These estimates are down from $1,050 per vehicle and $56 billion total in the proposed rule. The additional costs would be recovered with just a few years of fuel savings. EPA projects that if consumers were to value five years of fuel savings in their vehicle purchase, vehicle sales could increase beyond projected levels due to the combined effects of additional upfront costs and consumer fuel savings; however, lower consumer fuel valuation is estimated to decrease sales.

Climate change, oil security, and benefits. The rule is expected to produce cumulative savings of 962 million metric tons of greenhouse gas emissions and approximately 1.85 billion barrels of oil over the lifetime of the vehicles covered. Ultimately, the regulation is estimated to produce net benefits of between $140 billion and $189 billion dollars due to reduced fuel costs, reduced air pollution, reduced market externalities, reduced refueling time, and other factors that outweigh the initial technology costs associated with the new vehicles.

Safety. NHTSA revised its safety analysis for the Final Rule and now reports that the safety impacts "may be close to zero, or possibly beneficial if mass reduction is carefully undertaken in the future and if the mass reduction in the heavier light-trucks and vans is greater (in absolute terms) than in passenger cars."

International context. The ICCT has updated its chart that compares the GHG emission and fuel economy standards of major regulatory programs to reflect the new 250 gCO_2/mile standards described in the notice. The chart converts all regulatory programs to the European test cycle, so the U.S. agreement for 250 gCO_2/mile is equivalent to about 172 gCO_2/km when miles are converted to kilometers and adjusted to the European driving cycle.

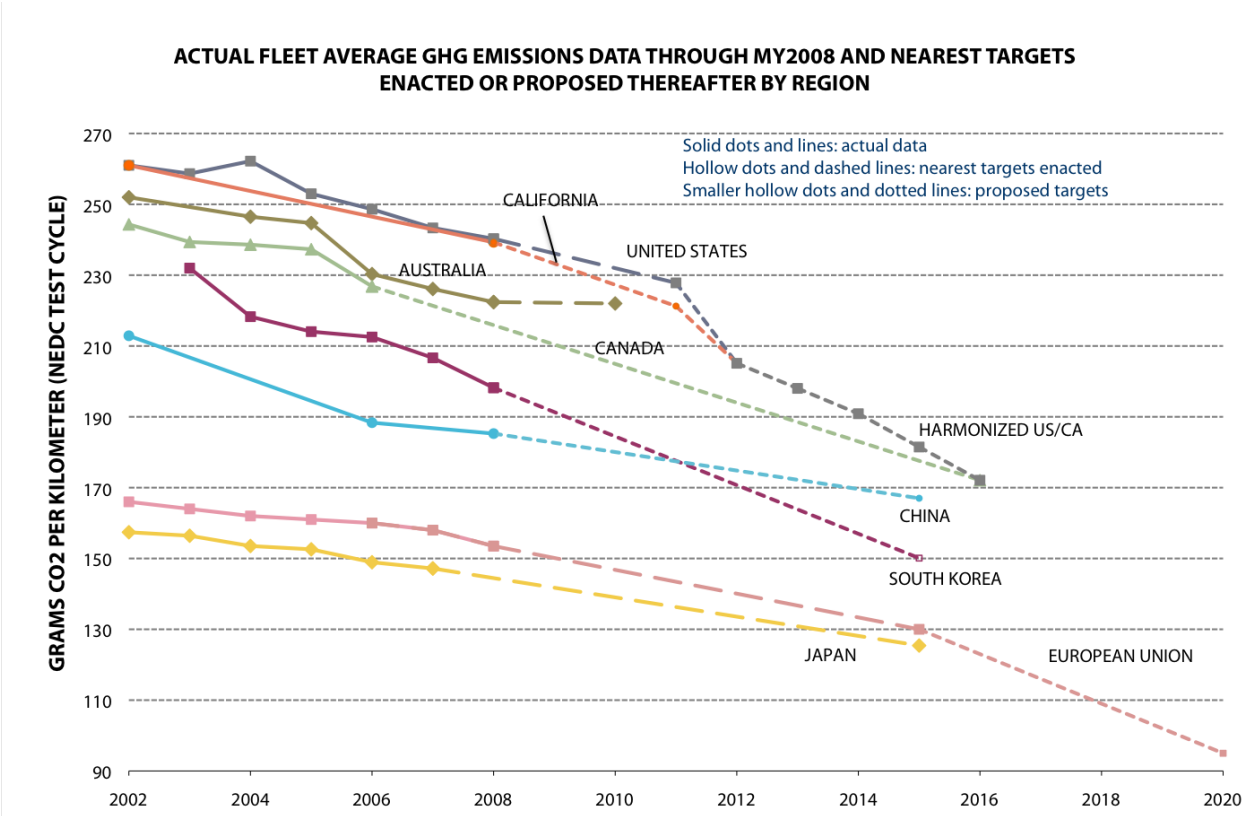

Figure 3. ICCT Comparison of Fuel Economy/GHG standards around the world.

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