Regulatory Announcement

EPA and NHTSA Adopt First-Ever Program to Reduce Greenhouse Gas Emissions and Improve Fuel Efficiency of Medium- and Heavy-Duty Vehicles

The U.S. Environmental Protection Agency (EPA) and the Department of Transportation's National Highway Traffic Safety Administration (NHTSA) are announcing a first-ever program to reduce greenhouse gas (GHG) emissions and improve fuel efficiency of heavy-duty trucks and buses. This fact sheet contains an overview of this new national program.

Overview

The Heavy-Duty National Program will reduce fuel use and GHG emissions from medium- and heavy-duty vehicles, from semi trucks to the largest pickup trucks and vans, as well as all types and sizes of work trucks and buses in between. The program will enhance American competitiveness and job creation, improve energy security, benefit consumers and businesses by reducing costs for transporting goods, and spur growth in the clean energy sector.

Vehicles covered by this program make up the transportation segment's second largest contributor to oil consumption and GHG emissions. This comprehensive program is designed to address the urgent and closely intertwined challenges of dependence on oil, energy security, and global climate change.

The HD National Program has been developed with support from industry, the State of California, and environmental stakeholders, and is a key component of the agencies'

EPA United States Environmental Protection Agency

Office of Transportation and Air Quality
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response to a Presidential Memorandum issued in May 2010.[1] The agencies estimate that the combined standards will reduce CO2 emissions by about 270 million metric tons and save about 530 million barrels of oil over the life of vehicles built for the 2014 to 2018 model years, providing $49 billion in net program benefits. The reduced fuel use alone will enable $50 billion in fuel savings to accrue to vehicle owners, or $42 billion in net savings when considering technology costs. A second phase of regulations is planned for model years beyond 2018.

Need to Reduce Fuel Consumption and Greenhouse Gases from Vehicles

Our country has two intertwined and critically important needs - to reduce oil consumption and to address global climate change. NHTSA and EPA have adopted the HD National Program to meet these needs by reducing fuel use and GHG emissions from on-highway transportation sources. The effect of these actions will be to improve energy security, increase fuel savings, reduce GHG emissions, and provide regulatory certainty for manufacturers.

Setting fuel consumption standards for the heavy-duty sector will improve our energy security by reducing our dependence on foreign oil, which has been a national objective since the first oil price shocks in the 1970s. Net petroleum imports now account for approximately 60 percent of U.S. petroleum consumption. Transportation accounts for about 77 percent of our domestic oil use, and heavy-duty vehicles account for about 17 percent of transportation oil use.[2]

Transportation sources emitted 29 percent of all U.S. GHG emissions in 2007 and have been the fastest-growing source of U.S. GHG emissions since 1990.[3] The primary GHGs of concern from transportation sources are carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and hydrofluorocarbons (HFC). The heavy-duty sector addressed in these joint rules accounted for nearly six percent of all U.S. GHG emissions and 20 percent of transportation GHG emissions in 2007. Within the transportation sector, heavy-duty vehicles are the fastest-growing contributors to GHG emissions.

Benefits and Costs of the HD National Program

The agencies estimate that the combined standards will reduce CO2 emissions by about 270 million metric tons and save about 530 million barrels of oil over the life of model year 2014 to 2018 vehicles.

Overall, EPA and NHTSA estimate that the HD National Program will cost the affected industry about $8 billion, while saving vehicle owners fuel costs of about $50 billion over the lifetimes of

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[1] Improving Energy Security, American Competitiveness and Job Creation, and Environmental Protection Through a Transformation of Our Nation's Fleet of Cars And Trucks" 75 FR 29399, May 26, 2010, www.whitehouse.gov/the-press-office/presidential-memorandum-regarding-fuel-efficiency-standards

[2] In 2009 Source: EIA Annual Energy Outlook 2010 released May 11, 2010

[3] 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

model year 2014-2018 vehicles, discounted at three percent.[4] In addition to fuel savings, the agencies have estimated monetized benefits from CO2 reductions, improved energy security, reduced time spent refueling, as well as possible increased driving accidents, traffic congestion, and noise. When considering all these factors, the HD National Program yields $49 billion in net benefits to society over the lifetimes of model year 2014-2018 vehicles, discounted at three percent.

Using technologies commercially available today, the majority of vehicles will see a payback period of less than one year, while others, especially those with with lower annual miles, will experience payback periods of up to two years. For example, an operator of a semi truck can pay for the technology upgrades in under a year, and have net savings up to $73,000 over the truck's useful life.

In addition to the benefits from reduced CO2, the EPA has estimated the benefits of reduced ambient concentrations of particulate matter and ozone resulting from the HD National Program. Air quality will improve and health impacts from these air pollutants will be reduced, with estimated monetized health-related benefits ranging from $1.3 to $4.2 billion in 2030, discounted at three percent. These calendar year benefits do not represent the same time frame as the model year lifetime benefits described above, so they are not additive.

In total, the combined standards will reduce GHG emissions from the U.S. heavy-duty fleet by approximately 76 million metric tons of CO2-equivalent annually by 2030. The potential impacts of the program that are not quantified and monetized in the analysis include the health and environmental impacts associated with changes in ambient exposures to toxic air pollutants, and the benefits associated with avoided non-CO2 GHGs (methane, nitrous oxide, HFCs).

Scope of Standards for Heavy-Duty Engines and Vehicles

The agencies have each adopted complementary standards under their respective authorities covering model years 2014-2018, which together form a comprehensive HD National Program. EPA and NHTSA have adopted standards for CO2 emissions and fuel consumption, respectively, tailored to each of three main regulatory categories: (1) combination tractors;[5] (2) heavy-duty pickup trucks and vans; and (3) vocational vehicles. Each of these is described further below. EPA has additionally adopted standards to control HFC leakage from air conditioning systems in pickups and vans and combination tractors. Also exclusive to the EPA program are EPA's N2O and CH4 standards that will apply to all heavy-duty engines, pickups and vans.

For purposes of this program, the heavy-duty fleet incorporates all on-road vehicles rated at a gross vehicle weight at or above 8,500 pounds, and the engines that power them, except those

[4] The stated costs and benefits indicate a present value of what many years of emissions reductions and fuel savings are worth to society, discounting the value that future reductions have to society versus reductions in the present day. These benefit estimates use the Annual Energy Outlook 2011 reference case fuel prices, and apply a Social Cost of Carbon (SCC) value of $22 per ton CO2 reduced. Other SCC values are presented and discussed in the preamble.

[5] Commonly known as semi trucks. The agencies are not adopting standards for trailers, thus this regulatory category denotes the main power unit portion of a tractor-trailer combined vehicle.

covered by the current GHG emissions and Corporate Average Fuel Economy standards for model year 2012-2016 passenger vehicles. [6]

Heavy-duty vehicles include both work trucks and commercial medium and heavy-duty on-highway vehicles as defined by the Energy Independence and Security Act (EISA). Heavy-duty engines affected by the final standards are generally those that are installed in commercial medium- and heavy-duty trucks and buses. The agencies' scopes are the same except that EPA is including recreational on-highway vehicles (RV's, or motor homes) within its rulemaking, while NHTSA is not including these vehicles.

Trailers are not covered under these rules, due to the first-ever nature of this program and the agencies' limited experience working in a compliance context with the trailer manufacturing industry. However, because trailers do impact the fuel consumption and CO2 emissions from combination tractors, and because of the opportunities for reductions, we intend to include them in a future rulemaking.

The agencies are developing these rules collaboratively under their respective authorities: the EPA is adopting GHG emissions standards under the Clean Air Act, and NHTSA is adopting fuel efficiency standards under EISA. The goal of the joint rulemakings is to present coordinated federal standards that help manufacturers to build a single fleet of vehicles and engines that are able to comply with both.

The agencies are considering a next phase of rules for this sector, as there are more opportunities to reduce GHG emissions and fuel use from the heavy-duty fleet for model years beyond 2018. The goals would include spurring innovation as well as updating the assessment of actual emissions and fuel use from this sector. Such future regulation would also be designed to align with similar programs developed outside the U.S.

Final Standards

It is important to note that the joint standards cover not only engines but also complete vehicles, allowing the agencies to achieve the greatest possible reductions in fuel consumption and GHG emissions, while avoiding unintended consequences. The majority of these vehicles carry payloads of goods or equipment, in addition to passengers. To account for this in the regulatory program, two types of standard metrics have been adopted: payload-dependent gram per mile (and gallon per 100-mile) standards for pickups and vans; and gram per ton-mile (and gallon per 1,000 ton-mile) standards for vocational vehicles and combination tractors. These metrics account for the fact that the work to move heavier loads burns more fuel, and emits more CO2 than in moving lighter loads.

The joint standards are rooted in regulatory history, EPA's SmartWay Transport Partnership program, and extensive technical and engineering analyses. In developing this HD National

[6] The final light-duty 2012-2016 standards cover some vehicles above 8,500 lbs. For example, the heavy-duty program excludes sport-utility vehicles, vans with less than a 13-person capacity, and ½-ton pickups.

Program, the agencies have drawn from the SmartWay Transport Partnership Program experience to identify technologies as well as operational approaches that fleet owners, drivers, and freight customers can incorporate. NHTSA and EPA believe that operational measures promoted by SmartWay can complement the final standards and provide benefits for the existing heavy-duty fleet.

The standards are also heavily influenced by a study mandated by Congress in EISA and conducted for NHTSA by the National Research Council.[7] This study examined many aspects of heavy-duty vehicle fuel consumption as well as considerations for establishing fuel consumption standards.

CO2 and Fuel Consumption Standards

Both EPA's and NHTSA's joint final standards for the three main heavy-duty regulatory categories are summarized below.

Combination Tractors

Heavy-duty combination tractors – the semi trucks that typically pull trailers - are built to move freight. Freight transportation customers choose tractors primarily based on two major characteristics: the gross vehicle weight rating (GVWR, which establishes the maximum carrying capacity of the tractor and trailer) and cab type (sleeper cabs provide overnight accommodations for drivers). Operators also consider the tractor roof height when mating with trailers for the most efficient configuration. The agencies have adopted differentiated standards for nine subcategories of combination tractors based on three attributes: weight class, cab type and roof height. The standards will phase in to the 2017 levels shown in Table 1. These final standards will achieve from nine to 23 percent reduction in emissions and fuel consumption from affected tractors over the 2010 baselines.

Table 1: MY 2017 Combination Tractor Standards

	EPA Emissions Standards (g CO2/ton-mile)			NHTSA Fuel Consumption Standards (gal/1,000 ton-mile)		
	Low Roof	Mid Roof	High Roof	Low Roof	Mid Roof	High Roof
Day Cab Class 7	104	115	120	10.2	11.3	11.8
Day Cab Class 8	80	86	89	7.8	8.4	8.7
Sleeper Cab Class 8	66	73	72	6.5	7.2	7.1

Heavy-Duty Pickup Trucks and Vans

The agencies are setting corporate average standards for heavy-duty pickup trucks and vans, similar to the approach taken for light-duty vehicles. Each manufacturer's standard for a model year depends on its sales mix, with higher capacity vehicles (payload and towing) having numerically less stringent target levels, and with an added adjustment for 4-wheel drive vehicles.

[7] Committee to Assess Fuel Economy Technologies for Medium- and Heavy-Duty Vehicles; National Research Council; Transportation Research Board (2010). "Technologies and Approaches to Reducing the Fuel Consumption of Medium- and Heavy-Duty Vehicles," Available electronically from the National Academies Press Website at http://www.nap.edu/catalog.

This approach recognizes both the inherently higher GHG emissions and fuel consumption of higher-capacity vehicles, and the importance of payload and towing capacity to the owners of these work trucks and vans.

EPA has established standards for this segment in the form of a set of target standard curves, based on a "work factor" that combines a vehicle's payload, towing capabilities, and whether or not it has 4-wheel drive. The standards will phase in with increasing stringency in each model year from 2014 to 2018. The EPA standards adopted for 2018 (including a separate standard to control air conditioning system leakage) represent an average per-vehicle reduction in GHG emissions of 17 percent for diesel vehicles and 12 percent for gasoline vehicles, compared to a common baseline.

NHTSA is setting corporate average standards for fuel consumption that are equivalent to EPA's standards (though not including EPA's final air conditioning leakage standard). The final NHTSA standards represent an average per-vehicle improvement in fuel consumption of 15 percent for diesel vehicles and 10 percent for gasoline vehicles, compared to a common baseline. To satisfy lead time requirements under EISA, NHTSA standards will be voluntary in 2014 and 2015. Both agencies are providing manufacturers with two alternative phase-in approaches that get equivalent overall reductions. One alternative phases the final standards in at 15-20-40-60-100 percent in model years 2014-2015-2016-2017-2018. The other phases the final standards in at 15-20-67-67-67-100 percent in model years 2014-2015-2016-2017-2018-2019.

Vocational Vehicles

Vocational vehicles consist of a very wide variety of truck and bus types including delivery, refuse, utility, dump, cement, transit bus, shuttle bus, school bus, emergency vehicles, motor homes, tow trucks, and many more. Vocational vehicles undergo a complex build process, with an incomplete chassis often built with an engine and transmission purchased from different manufacturers, which is then sold to a body manufacturer. In these rules, the agencies are regulating chassis manufacturers for this segment. The agencies have divided this segment into three regulatory subcategories - Light Heavy (Class 2b through 5), Medium Heavy (Class 6 and 7), and Heavy Heavy (Class 8), which is consistent with the engine classification.

After engines, tires are the second largest contributor to energy losses of vocational vehicles. The final program for vocational vehicles for this phase of regulatory standards is limited to tire technologies (along with the separate engine standards). The standards depicted in Table 2 represent emission reductions from six to nine percent, from a 2010 baseline.

Table 2: MY 2017 Vocational Vehicle Standards

	EPA Full Useful Life Emissions Standards (g CO2/ton-mile)	NHTSA Fuel Consumption Standards (gal/1,000 ton-mile)
Light Heavy Class 2b-5	373	36.7
Medium Heavy Class 6-7	225	22.1
Heavy Heavy Class 8	222	21.8

EPA's N2O, CH4 and Air Conditioning Leakage Standards

In addition to the CO2 standards described above, EPA has adopted standards for N2O and CH4 emissions. N2O and CH4 are important GHGs that contribute to global warming, more so than CO2 for the same amount of emissions. While today's gasoline and diesel engines emit relatively low levels of N2O and CH4 emissions, EPA's standards will act to cap emissions to ensure that manufacturers do not allow the N2O and CH4 emissions of their future engines to increase significantly above the currently controlled low levels.

Air conditioning (A/C) systems contribute directly to GHG emissions through leakage of HFC refrigerants, which are powerful GHG pollutants. EPA has adopted standards to assure that high-quality, low-leakage components are used in each air conditioning system designed for heavy-duty pickup trucks and vans, and semi trucks. The standard for larger A/C systems (capacity above 733 grams) is measured in percent total refrigerant leakage per year, while the standard for smaller A/C systems (capacity of 733 grams or less) is measured in grams of refrigerant leakage per year.

Program Flexibilities

EPA's and NHTSA's final HD National Program provides flexibilities to manufacturers in terms of how they can comply with the new standards. These flexibilities are 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 consumption objectives.

The primary flexibility provisions are an engine averaging, banking, and trading (ABT) program and a vehicle ABT program. These ABT programs will allow for emission and fuel consumption credits to be averaged, banked, or traded within each of the defined averaging sets. There are three weight-based averaging sets for two of the regulatory categories: combination tractors and vocational vehicles. The pickup trucks and vans are one fleetwide averaging set, and there are four averaging sets for engines.

In addition to the general ABT programs, EPA is providing engine manufacturers and heavy-duty pickup and van manufacturers the added option of using CO2 credits to offset CH4 or N2O emissions that exceed the applicable emission standards based on the relative global warming potentials of these emissions.

The structure of the ABT program for HD engines is based closely on earlier EPA ABT programs for HD engines; the program for pickup trucks and vans is built on the existing light-duty GHG and fuel economy credit carry-forward, carry-back, and trading provisions; and first-time ABT provisions are adopted for other HD vehicle manufacturers that are as consistent as possible with the provisions for other categories.

The agencies have adopted three additional optional credit opportunities. The first is an early credit option intended for manufacturers who demonstrate improvements in excess of the standards prior to the model year that they become effective. The second is a credit program

intended to promote implementation of advanced technologies, such as hybrid powertrains, engines with Rankine cycle waste heat recovery systems, and electric or fuel cell vehicles. The last is a credit intended to apply to new and innovative technologies that reduce vehicle CO2 emissions and fuel consumption, for which the benefits are not captured over the test procedure used to determine compliance with the standards (i.e., "off-cycle").

For More Information

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

www.epa.gov/otaq/climate/regulations.htm

You can access the final joint rules and related documents, including the Environmental Impact Statement, on NHTSA's Fuel Economy Web site at:

www.nhtsa.gov/fuel-economy

For more information on these and related rules, please contact EPA or NHTSA.

EPA OTAQ Public Inquiries
www.epa.gov/otaq/oms-cmt.htm

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