The U.S. Automotive Fuel Economy Policy

1.0 Background

The U.S. is the world's largest economy and second largest greenhouse gas (GHG) emitter, accounting for about 20% of global emissions. The current Administration in the U.S. has set a target in the range of 17% below 2005 levels in 2020 as part of its goal to reduce greenhouse gas emissions 83% by 2050. The U.S. has controlled CO_2 emissions longer than any other country and has a well developed fuel economy program.

Mobile sources emitted 31.5% of all U.S. GHG in 2006, and have been the fastest-growing source of U.S. GHG emissions since 1990. Light-duty vehicles emit four GHGs – CO_2, methane, nitrous oxide, and hydrofluorocarbons – and are responsible for nearly 60% of all mobile source GHGs. For light-duty vehicles, CO_2 emissions measured over the EPA tests used for fuel economy compliance represent over 90% of total light-duty vehicle greenhouse gas emissions.

The U.S. also has the largest mix of vehicle types compared to other countries as well as the heaviest group of vehicles. For this reason, the U.S. has one of the lowest fuel economy averages.

1.1 The U.S. Light-Duty Vehicle Fleet

Technologically, the U.S. fleet is one of the most advanced in the world. Vehicles are produced in the U.S. and are imported from manufacturers around the world. There is a robust vehicle market in the U.S. with 16 to 17 million new cars sold each year, although the economic downturn reduced this level to about 10 million new cars in 2008. It is expected that the new car fleet will return to a level of about 13-14 million new cars by 2010-11.

The passenger car fleet is predominantly powered by petrol. There is a small increase in the number of advanced diesel vehicles being sold in the U.S. recently, and these numbers are likely to increase with the new CAFE standards that have been proposed and are likely to be adopted by March 2010. In 2009, the percentage of the fleet that is diesel was 0.5%. This is an increase from the 0.1% market share that was in existence in 1998.

The U.S. fleet has a growing number of hybrid electric vehicles in the market and research is ongoing on fuel cell vehicles and plug-in hybrid vehicles as well as other technologies to improve conventional gasoline engines.

1.2 Status of LDV fleet fuel consumption/CO_2 emissions

The U.S. has had fuel economy standards in place since 1978. These standards are set by the National Highway Traffic Safety Administration (NHTSA) and the testing to determine compliance with the standards is administered by the Environmental Protection Agency (EPA).

Most recently, both agencies proposed new Corporate Average Fuel Economy (CAFE) standards of 35 miles per gallon (mpg) by 2016. These standards are to be finalized by March 2010. Standards are separate for passenger cars and light trucks. It is important to remember that when the CAFE standards were first set, light trucks were mostly pickup trucks used in farming and construction and were about 9 percent of the market. The introduction of SUVs and other truck derivatives changed that situation to where trucks now are about half of the new vehicle market. This has led to a vast increase in the percentage of oil used in the transport sector, with more than 60% of oil consumed in the US, and over 25% of domestic carbon pollution emanating from cars and trucks.[1]

There are provisions that allow manufacturers to gain credits for three years and use these credits over a three-year period. Essentially, if you exceed the standard in one year, you can bank that credit and use it if you fail to meet the standard in an upcoming year. The domestic U.S. manufacturers use these credits more than other manufacturers in order to meet the standard every year. The European manufacturers generally just pay the CAFE penalty and the Japanese manufacturers are generally above the CAFE standard. The penalty for failing to meet the CAFE standard is US$5.50 for every 1/10th of a mile per gallon times the manufacturers' entire production of vehicles. So, a manufacturer who makes 2 million cars per year which misses the CAFE target by 1/10th of a mpg would have to pay a fine of $11M.

Cars are subdivided by size class for purposes of determining compliance with the CAFE standards, at least until the most recent changes to the CAFE Standards, where "footprint"[2] is used to classify vehicles.

The projected fleet wide average real world model year (MY) 2009 light-duty vehicle CO_2 emissions level is 422 grams per mile (g/mi) (291.2 g/km or 12.5 l/100km). The fleet wide average MY2008 value is 424 g/mi (292.6 g/km or 12.6 l/100km)). The MY2008 value is essentially a final value as the database for 2008 includes formal production data for nearly the entire MY2008 fleet, while the projected MY2009 value is based on pre-model year production projections provided by automakers and are therefore much more uncertain. At this time, it is not possible to predict whether the market turmoil in 2009 will yield an actual CO_2 emission value that is higher or lower than the preliminary MY2009 value reported here. The preliminary 422 g/mi value for model year 2009 represents a 39 g/mi, or 8%, decrease relative to the 461

[1] Walsh, M. *Car Lines.* Issue 2010 (3), June 2010.

[2] *Footprint* is defined as the product of track width (measured in inches and rounded to the nearest tenth of an inch) times wheelbase (measured in inches and rounded to the nearest tenth of an inch) divided by 144 and then rounded to the nearest tenth of a square foot. For purposes of this definition, track width is the lateral distance between the centerlines of the base tires at ground, including the camber angle. For purposes of this definition, wheelbase is the longitudinal distance between front and rear wheel centerlines. Definition from http://ecfr.gpoaccess.gov

g/mi (318.1 g/km or 13.7 l/100km) value for 2004, which was the highest CO_2 emissions value since 1980.

2.0 Regulatory Policies

2.1 National Standard

The U.S. reacted to the oil shortages in the early '70s with a law that created the CAFE standards. This law was the Energy Policy and Conservation Act (EPCA) which was signed into law in 1975. This law established standards that took effect in 1978. A complete list of the CAFE standards can be found **here.** The chart below shows the CAFE fuel economy standards since the beginning of the program.[3] Two sets of standards have been established: those for passenger cars and for light trucks. For passenger cars, a manufacturers' domestic and import fleets must meet the applicable CAFE standard separately.

CAFE Fuel Economy Standards, mpg

Year	Cars	Light Trucks		
		Combined	2WD	4WD
1978	18.0			
1979	19.0		17.2	15.8
1980	20.0		16.0	14.0
1981	22.0		16.7	15.0
1982	24.0	17.5	18.0	16.0
1983	26.0	19.0	19.5	17.5
1984	27.0	20.0	20.3	18.5
1985	27.5	19.5	19.7	18.9
1986	26.0	20.0	20.5	19.5
1987	26.0	20.5	21.0	19.5
1989	26.5	20.5	21.5	19.0
1990	27.5	20.0	20.5	19.0
1991	27.5	20.2	20.7	19.1
1992	27.5	20.2		
1993	27.5	20.4		
1994	27.5	20.5		
1995	27.5	20.6		
1996	27.5	20.7		
2005	27.5	21.0		
2006	27.5	21.6		
2007	27.5	22.2		
2008	27.5	22.5		
2009	27.5	23.1		
2010	27.5	23.5		

Credit: Dieselnet.com

[3] June 2010 Dieselnet, Accessible http://www.dieselnet.com/standards/us/fe.php

Under new rules drafted jointly by the EPA and Transport Department in 2010, new standards for model year 2016 vehicles must get an average of 35.5 mpg by 2016 (172 g/km or 7.4 l/100km), four years ahead of the schedule Congress laid out in its 2007 energy law. According to the Administration's estimates, the new rules will reduce carbon dioxide emissions by nearly 1 billion metric tons over the lifetime of the vehicles covered, or roughly the equivalent of taking 50 million cars and trucks off the road in 2030. Vehicles purchased under the new rules will conserve an estimated 1.8 billion barrels of oil over their lifetime.[4] The new rules to take effect in 2016 target four types of pollutants - carbon dioxide, methane, nitrous oxide and hydrofluorocarbons. This gives automakers the ability to meet the standards through a variety of measures, such as substituting new refrigerants, adding hybrid and electric cars, producing vehicles with smaller turbocharged engines and with engines that do not have to idle at stop signs or in traffic.[5]

When the vehicle standards take effect, greenhouse gases will officially become "subject to regulation" under the Clean Air Act, which will trigger Clean Air Act permitting requirements for industrial sources like power plants, refineries and other large facilities. EPA earlier said it will start to regulate stationary sources as soon as Jan. 2, 2011, when automakers must begin to comply with the rule.[6] The new rules can be viewed here.

CAFE[7] fuel economy testing is done over the same laboratory test that is used to measure exhaust emissions (FTP-75). CAFE certification is typically done based on fuel economy data provided by the manufacturers. In some cases, the EPA performs the testing in its laboratory in Ann Arbor, Michigan. The CAFE fuel economy figures can be significantly different from the vehicle fuel economy data published by the EPA/DOE in the Fuel Economy Guide report and on new vehicle labels. There are three sets of fuel economy figures:

1. EPA's unadjusted dynamometer values,
2. EPA's adjusted on-road values, and
3. NHTSA's CAFE values.

The unadjusted EPA values are calculated based on CO2 emissions measured over the dynamometer test, using a carbon balance equation. The EPA on-road fuel economy values provided to consumers on new vehicle labels, in the EPA/DOE Fuel Economy Guide, and in EPA's Green Vehicle Guide are adjusted downward by 15%, to make the data more representative of the real world driving conditions.

The U.S. measures fuel economy, not fuel consumption, so the mileage is computed in miles per gallon (mpg). Information on this test cycle can be found **here**.

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[4] Eilperin, J. "Emissions limits, greater fuel efficiency for cars, light trucks made official." *The Washington Post,* 2 April 2010. Accessible http://www.washingtonpost.com/wp-dyn/content/article/2010/04/01/AR2010040101412.html.
[5] Eilperin, J. "Emissions limits, greater fuel efficiency for cars, light trucks made official." *The Washington Post,* 2 April 2010. Accessible http://www.washingtonpost.com/wp-dyn/content/article/2010/04/01/AR2010040101412.html.
[6] Voorhees, J and Robin Bravander. "Climate: Obama admin boosts auto fuel-economy standards, imposes tailpipe GHG Curbs." *E&E Publishing,* 1 April 2010. Accessible http://www.eenews.net/public/Greenwire/2010/04/01/1.
[7] June 2010 Dieselnet, Accessible http://www.dieselnet.com/standards/us/fe.php

2.2 Import restrictions

There are no import restrictions in place in the U.S. Any car that meets the emission standards in place for each year may be sold in the U.S. There is also a vocal lobby, from the classic car enthusiasts, for the ability to keep older cars in the U.S. Most of the older vehicles are kept in garages and driven very little, so their impact on the fuel economy of the fleet is negligible.

New Vehicles

New vehicles are subject to certain rules as specified by the U.S. Clean Air Act in terms of emission standards and the EPCA in terms of fuel economy. Meeting both of these requirements is essential and subject to significant penalties for failure to comply.

Second Hand

There are no restrictions on second hand vehicles since most of the second hand vehicles in the U.S. originate in the U.S. and meet whatever standards are in place for that model year of vehicle. Some "gray market" vehicles are imported from overseas. These vehicles must follow certain procedures to make sure that they meet the current emissions and safety standards. There are laboratories that exist that have the expertise to make these changes to the cars that are imported, but do not meet the current U.S. standards. There are no fuel economy requirements for this type of vehicle.

Technology mandates/targets

There are no technology mandates *per se* in the U.S. The standards in place now are performance-based standards. However, when the catalytic converter technology was developed in the early 1970s, EPA set emission standards that required the use of catalysts to meet them. Use of this technology allowed the use of other technology that could be used to improve fuel economy.

3.0 Fiscal Measures and Economic Instruments

3.1 Fuel Taxes

Fuel taxes in the U.S. are generally low and politically unpopular, so they are not likely to be raised in the near term. With reduction in miles travelled due to economic conditions, many states are looking for alternatives to the gas tax. A number of alternatives are being explored including road charges based on miles driven. This could be done with RFID transmitters sending odometer readings to sites when the car is refuelled or passes a receiver. This would put the burden on those who drive more miles rather than tax people based on the fuel they buy. Other alternatives are also being discussed such as pay as you drive insurance, etc.

3.2 Fee-bate

No fee-bate program exists in the U.S., although fee-bate programs have been discussed for many years.

3.3 Buy-back

The U.S. implemented the Cash for Clunkers program which is described in detail **here.**

3.4 Other tax instruments

The U.S. imposed a tax called the Gas Guzzler Tax, based on a law entitled the Energy Tax Act. This law applied a tax to vehicles that achieved less than a specified fuel economy rating, i.e. 22.5 mpg combined city and highway rating. This tax goes from $1,000 for a vehicle that achieves at least 21.5 mpg up to $7,000 for a vehicle that gets 12.5 mpg. A chart of the fees for this tax can be found **here.**

3.5 Registration fees

In the U.S., registration fees are administered by the states and vary widely from one state to the other. Most of the states impose yearly registration fees which cost as much as $25 or more.

3.6 R&D

The United States consumes more than 20 million barrels of oil each day, two-thirds of which is imported, leaving the nation vulnerable to rising prices. Oil combustion produces emissions linked to health problems and global warming. In January 2003, the administration announced a 5-year, $1.2 billion Hydrogen Fuel Initiative to perform research, development, and demonstration (R&D) for developing hydrogen fuel cells for use as a substitute for gasoline engines. Led by the Department of Energy (DOE), the initiative's goal is to develop the technologies by 2015 that will enable U.S. industry to make hydrogen-powered cars available to consumers by 2020. DOE's hydrogen program has made important progress in all R&D areas, including both fundamental and applied science. Specifically, DOE has reduced the cost of producing hydrogen from natural gas, an important source of hydrogen through the next 20 years; developed a sophisticated model to identify and optimize major elements of a projected hydrogen delivery infrastructure; increased by 50 percent the storage capacity of hydrogen, a key element for increasing the driving range of vehicles; and reduced the cost and improved the durability of fuel cells. However, some of the most difficult technical challenges lie ahead, including finding a technology that can store enough hydrogen on board a vehicle to achieve a

300-mile driving range, reducing the cost of delivering hydrogen to consumers, and further reducing the cost and improving the durability of fuel cells. The difficulty of overcoming these technical challenges, as well as hydrogen R&D budget constraints, has led DOE to push back some of its interim target dates.

In addition, the US EPA is making grant funds available and soliciting applications from eligible entities utilizing state-of-the-art experimental techniques and numerical simulations focusing on comprehensive research to develop new cutting-edge engine technologies. This effort is part of the Advanced Vehicle Program, to develop advanced combustion systems that not only meets today's Clean Air standards, but also establishes a critical foundation of support to ensure U.S. leadership in developing and producing the next generation of advanced vehicle technologies. This exciting program provides support for commercially viable vehicle of the future through innovation in cleaner and more efficient technologies that will help achieve energy independence and reduce greenhouse gas emissions. EPA partners with industry to maximize the viability of targeted technologies for commercial production through cooperative research and development agreements.

4.0 Traffic Control Measures

4.1 Priority lanes

Allowing fuel efficient vehicles on priority lanes is handled by state governments and vary from state to state. **Virginia** did allow hybrid electric vehicles to use the main High Occupancy Vehicle (HOV) lanes from Virginia into the District of Columbia, but this exception was revoked when so many people bought hybrids to avoid traffic jams, that the HOV lanes got too crowded. There was no control on the number of hybrids that could use the lanes.

Starting May 15, 2008 the **Colorado** Department of Transportation's (CDOT) hybrid vehicle program will allow owners of qualifying Hybrid Vehicles to apply for a permit to use High Occupancy Vehicle ("HOV") lanes and High Occupancy Toll ("HOT") lanes. Qualifying vehicles must display the required HOV exemption decal and transponder. Initially 2000 permits will be issued and will be accepted online and through mail. Facilities will be monitored to ensure minimal impacts to high occupancy vehicles and after a period of time will be reevaluated to see if additional permits may be issued.

Clean Pass is an innovative program that will allow eligible low-emission, energy-efficient vehicles to use the 40-mile **New York** Long Island Expressway/High Occupancy Vehicle (LIE/HOV) lanes, regardless of the number of occupants in the vehicle. The program will result in an estimated reduction of 6,000 tons of greenhouse gas emissions and savings in excess of 500,000 gallons of gasoline. The one-year pilot program will expand the use of energy-efficient vehicles, providing Long Island commuters with incentives to save money, gas and time, while reducing stress during the daily commute on the LIE. Motorists whose estimated United States

Environmental Protection Agency (USEPA) fuel economy rating averages at least 45 miles per gallon and meets certain USEPA strict emissions standards will be allowed to participate by applying to the State Department of Motor Vehicles.

4.2 Parking

Some states give priority parking to certain vehicles, such as California, where there are electric vehicle (EV) charging stations where only EVs can park.

On June 6, 2005, the city of New Haven, Connecticut passed a law permitting hybrid vehicles registered in New Haven free parking at metered spots within the city. The ordinance will take effect within one month and only apply to alternative fuel vehicles registered in New Haven. Owners will have to come to City Hall to receive a decal which will be attached the to vehicle. Motorists will still need to obey posted time limits and must park in legal spots.

Owners of hybrid cars will get discounts on parking at the 15 city-owned parking garages in Baltimore, Maryland. The plan cuts between $32 and $85 from the monthly fees for owners of the fuel-efficient vehicles. Baltimore will limit participation to 200 vehicles and the program will apply only to monthly, contract parking. Drivers of the three most fuel-efficient models can apply for a decal that will let them park in designated spots in the city's garages.

In Westchester, New York, starting in January 2006, hybrid vehicle owners will be allowed to park for free at two county-owned commuter lots. The cost of a monthly permit is usually $75.00. The county has about 1,100 commuter spaces available at two lots—about 200 of them on Central Avenue in White Plains at the Westchester County Center and the other 900 on Fisher Avenue in North White Plains, near the train station.

The City of Austin, Texas' "Drive Clean, Park Free" program gives city-registered owners of hybrid vehicles that receive an EPA air pollution score of 8 or better a $100 pre-paid parking cards to park in any of the city's 3,700 parking meters. Owners must submit an application to the city and receive a bumper sticker showing their participation in the program. Eligible vehicles must be purchased at certified dealerships within the Austin City Limits. For more information click here.

The City of San Antonio,Texas allows owners of hybrid vehicles to park for free at street parking meters. A City ordinance requires all owners wishing to take advantage of the one-year pilot program to register their hybrid vehicles with the City's Parking Division. Registered hybrid vehicle owners can park at any of the City's 2,010 street parking meters without charge, including the pilot Pay & Display locations. All drivers must follow street parking meter rules, such as parking for only the time allotted at the respective meter.

Salt Lake City, Utah, grants free metered parking to vehicles powered solely by an alternative fuel (i.e. propane, compressed natural gas, or electricity) or vehicles that are "top performers" in regards to city fuel economy or emissions. All available hybrids qualify. For details on this program, click here.

4.3 Road pricing

There are High Occupancy Toll (HOT) lanes in California where the driver pays for the privilege of driving in a HOV lane. These were recently put in place, where users were charged a higher fee for rush hour travel. Again, because of the traffic situation in CA, many people seem willing to pay large amounts for travelling in less congested conditions[8].

5.0 Information

5.1 Labeling

There has been a fuel economy labelling program in the U.S. since the CAFE standards were put in place in 1978. It was designed and is administered by the EPA. The U.S. also has a website www.fueleconomy.gov which lists the fuel economy estimates for all vehicles. For a copy of the U.S. label, click **here.**

5.2 Public info

Auto dealers are required to have copies of the gas mileage guide available on the showroom floor. This is required by federal law.

5.3 Industry reporting

Fuel economy data is well known and communicated in the U.S. Besides the USEPA website noted above, very specific data on vehicle type, weight, transmission type, etc. are available from publications such as Ward's Auto Reports and Automotive News. Wards' Auto Reports now publishes their report jointly with the Alliance of Automobile Manufacturers. The US EPA also publishes the Fuel Economy Trends Report which has been published for a number of years and is published annually. This document follows the trends in fuel economy over the past year and does a number of analyses based on the fuel economy data.

The text above is a summary and synthesis of the following sources:

[8] "Express (HOT) Lanes and Carpool Lanes". *Metropolitan Transportation Commission, FAQ,* Accessed June 15, 2010. Available on-line (http://www.mtc.ca.gov/planning/hov/faq.htm)

An, Feng and Amanda Sauer. "Comparison of Passenger Vehicle Fuel Economy and Greenhouse Gas Emission Standards Around the World." *Pew Center of Global Climate Change,* 2004: 1-36.

Cherian, E. "Refining Energy Storage in Transportation Markets: The Lithium Revolution". *Battery Power,* 2009. Accessed 15 June 2010. Available on-line (http://www.batterypoweronline.com/eprints/Frost_0709.html).

"Engine Research and Development for Future Advanced Vehicle Technologies that will Improve Fuel Efficiency and Reduce Emissions". *US Environmental Protection Agency.* Accessed 15 June 2010. Available on-line (http://www.epa.gov/oar/grants/OTAQ_1_10.pdf).

Fulton, L. "International Comparison of Light-duty Vehicle Fuel Economy and Related Characteristics." *International Energy Agency Working Paper Series,* 2010: 1-70.

"Hydrogen Fuel Initiative: DOE Has Made Important Progress and Involved Stakeholders but Needs to Update What It Expects to Achieve by Its 2015 Target". *US Government Accountability Office,* 11 January 2008. Accessed 15 June 2010. Available on-line (http://www.gao.gov/products/GAO-08-305;)

"Passenger Vehicle Greenhouse Gas and Fuel Economy Standards: A Global Update." *The International Council on Clean Transportation*, 2007: 1-35.

USEPA Department of Transportation. "Proposed Rulemaking to Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards." *United States Environmental Protection Agency.* USEPA 2009. Accessed 18 Feb. 2010 (http://www.epa.gov/fedrgstr/EPA-AIR/2009/September/Day-28/a22516a.pdf).

USEPA Office of Transportation and Air Quality. "Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2009." *United States Environmental Protection Agency*. USEPA, 2009. Accessed 18 Feb. 2010 (http://www.epa.gov/oms/fetrends.htm).