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before the

SUBCOMMITTEE ON ENERGY AND POWER

COMMITTEE ON ENERGY AND COMMERCE

U. S. HOUSE OF REPRESENTATIVES

July 17, 2012

Mr. Chairman and Members of the Subcommittee, I appreciate the opportunity to appear before you today to address the outlook for light duty vehicles and the fuels used in those vehicles.

The U.S. Energy Information Administration (EIA) is the statistical and analytical agency within the U.S. Department of Energy. EIA collects, analyzes, and disseminates independent and impartial energy information to promote sound policymaking, efficient markets, and public understanding regarding energy and its interaction with the economy and the environment. EIA is the Nation's premier source of energy information and, by law, its data, analyses, and forecasts are independent of approval by any other officer or employee of the United States Government. The views expressed herein should therefore not be construed as representing those of the Department of Energy or other federal agencies.

Petroleum dominates energy use in transportation

The transportation sector and the use of petroleum fuels are tightly linked. In 2010, 71 percent of total U.S. petroleum consumption occurred in the transportation sector, while petroleum products provided about 93 percent of total transportation energy. Light-duty vehicles (LDVs), including both passenger cars and light-duty trucks, accounted for 60 percent of total transportation energy use in 2010.

LDVs are almost entirely fueled by petroleum, with the petroleum content of motor gasoline accounting for 92 percent (7.9 million barrels per day (mmbd)) of energy use and diesel fuel representing another 2 percent (0.1 mmbd). Biofuels account for essentially all remaining LDV energy use.

The *Annual Energy Outlook 2012*

EIA recently released the *Annual Energy Outlook 2012* (*AEO2012*), which presents projections for the U.S. energy system through 2035. The *AEO2012* Reference case is a business-as-usual trend estimate, using known technology and technological and demographic trends, and is prepared under the assumption that current laws and regulations remain unchanged throughout the projection period. The large share of U.S. energy and petroleum use by LDVs has made them a focal point for legislation, regulation, and tax policies to both improve fuel economy and promote the sale of alternatively-fueled vehicles and alternative fuels. Higher fuel economy standards reduce both petroleum and energy consumption, while the use of alternative fuels displaces petroleum without necessarily reducing overall energy use.

The *AEO2012* Reference case includes the jointly issued Corporate Average Fuel Economy (CAFE) and greenhouse gas emissions standards for model year (MY) 2012 to 2016 LDVs promulgated by the National Highway Traffic Safety Administration (NHTSA) and the Environmental Protection Agency (EPA). It also assumes a further increase in CAFE standards to 35 miles per gallon (mpg) by MY 2020, as required by the

Energy Independence and Security Act of 2007 (EISA). In addition, the Reference case incorporates other provisions impacting the transportation sector, such as the Renewable Fuels Standard (RFS) for biofuels, waivers allowing the use of E15 in MY 2001 and newer vehicles, existing emissions standards for conventional criteria pollutants from LDVs, and existing tax credits for alternative/advanced vehicles and fuels. Tax credits for vehicles and fuels are assumed to sunset at the dates specified by laws in effect as of the start of 2012.

Beyond the Reference case, *AEO2012* includes analysis of several alternative cases with market, technology, or policy assumptions that can significantly change the outlook for LDV energy use. These include high and low oil price cases that impact fuel costs, a CAFE Standards case that incorporates the fuel economy and greenhouse gas emission standards for MYs 2017 to 2025 that have been proposed by NHTSA and EPA, and a case that considers the impacts of a breakthrough in battery vehicle technology. The "Market Trends" and "Issues in Focus" sections from *AEO2012* that address LDV issues are enclosed in this testimony.

My testimony briefly summarizes highlights of the *AEO* projections and then discusses some key uncertainties affecting both the near-term and longer-term outlook.

Projected Vehicle Mix and Efficiencies

Although sales of LDVs that use diesel, alternative fuels, and/or hybrid electric systems have increased in recent years, gasoline-only non-hybrid vehicles have maintained a dominant sales share. In 2010, gasoline-only non-hybrid vehicles had an 86 percent market share out of 10.8 million new LDVs sold, followed by flex fuel, hybrid electric, and diesel vehicles at 9, 3, and 2 percent, respectively.

Vehicles using alternative fuels and/or hybrid technologies are projected to play a growing role over time, due to policy, rising fuel prices, and technology advances. In the *AEO2012* Reference and CAFE Standards cases, gasoline-only non-hybrid vehicle sales are, respectively, 65 percent and 36 percent of projected new LDV sales in 2035. Micro hybrids, vehicles that combine gasoline internal combustion engines with larger batteries and electrically powered auxiliary systems that allow the engine to be turned off when the vehicle is coasting or idling and then quickly restarted, account for 46 percent of projected new LDV sales in the CAFE Standards case.

Flex-fuel vehicles (FFVs), which can use ethanol in blends of up to 85 percent, account for roughly 17 percent of projected new LDV sales in 2035 in both the Reference and CAFE Standards cases. The share of FFVs in both cases rises as the model seeks to accommodate the RFS mandate for increased biofuels use. Drop-in biofuels also play an important role in response to the RFS.

The projections show significant fuel economy improvements for gasoline-only vehicles with conventional drivetrains. The fuel economy of gasoline-only passenger cars, including micro hybrids, increases from 32 mpg in 2010 to 38 mpg in 2025 in the Reference case or 51 mpg in 2025 in the CAFE standards case. The fuel economy of gasoline powered light trucks, including micro hybrids, rises from 24 mpg in 2010 to 31 mpg in 2025 in the Reference case or 37 mpg in the CAFE standards case.

Projected LDV Energy Use

Growth in the number of drivers and vehicle miles per driver results in a projected growth of 35 percent in total LDV vehicle miles of travel between 2010 and 2035 in the Reference case. However, due to rising fuel economy, overall LDV energy consumption is projected to decrease by 3 percent, or 0.5 quadrillion British thermal units (Btu), between 2010 and 2035 despite rising travel demand. Projected LDV petroleum use in 2035 is about 7.1 mmbd, about 0.9 mmbd lower than the level in 2010, reflecting both changes in the fuel mix and improved fuel economy. In the CAFE standards case, overall LDV energy consumption decreases by 20 percent, or 3.2 quadrillion Btu, between 2010 and 2035, while projected LDV petroleum use in 2035 is about 5.8 mmbd, 28 percent lower than its 2010 level. (**Table 1**)

Petroleum products remain the dominant LDV fuel in both the Reference and CAFE Standards cases, with the motor gasoline (excluding ethanol) share falling to between 80 and 82 percent (from 92 percent currently) while the diesel share remains relatively stable

at around 4 percent (from 2 percent) by 2035. Biofuels play a growing role and are projected to provide almost 13 percent of energy used by LDVs by 2035 in the Reference case, up from 7 percent in 2010 driven primarily by the RFS mandate (**Figure 1**). Electricity usage begins to grow but remains small at about 0.3 percent while natural gas accounts for less than 0.2 percent. This is due partially to the fact that electric vehicles are very efficient and for the same amount of travel use significantly less fuel. Electricity usage grows much more rapidly in the *AEO* High Technology Battery case.

Biofuels Issues

There are several challenges under the RFS which, as modified by EISA, sets separate volume requirements for several specific biofuel categories including cellulosic biofuels. The total volumetric requirement for all renewable biofuels increases annually from 15.2 billion gallons this year to 36 billion gallons in 2022, including a target for cellulosic biofuels that grows from 500 million gallons this year to 15 billion gallons in 2022.

First, all EIA projections since the enactment of EISA have reflected a view that rates of technology development and market penetration for cellulosic biofuel technologies would not support attainment of its cellulosic biofuel targets. EIA projections for cellulosic biofuels supply have been further reduced in *AEO2012,* as progress towards large-scale commercial production has slowed.

Second, the average concentration of ethanol in the U.S. gasoline supply, including all blends, reached 10 percent in the summer of 2011. While EPA has approved the sale of blends up to 15 percent ethanol for use in MY 2001 and newer non-flex fuel vehicles, prospects for widespread market acceptance are uncertain.

Third, in the *AEO2012* projections, FFVs are assumed to use significant volumes of renewable fuel in the form of E85 beyond 2015. EIA estimates that about 9.8 million FFVs were already in use as of 2011, but those vehicles were almost entirely fueled with gasoline and consumed just over 0.002 million barrels per day of E85. Widespread use of E85 is likely only if its pump price is low enough to make it economically attractive relative to gasoline after taking account of the difference in energy content between the two fuels. Economically attractive fuel pricing could also help to encourage the build out of ethanol refueling infrastructure. There are currently only about 2300 publicly accessible E85 refueling stations across the country, and these are heavily clustered in the upper Midwest.

Uncertainty in the *AEO2012* projections for the LDV vehicle mix and fuel use

The *AEO2012* Reference case projections for LDVs and their fuel use are inherently uncertain. This section discusses four key areas of uncertainty: fuel prices, technology costs, consumer acceptance, and potential changes in policies.

First, all vehicle types face uncertainty regarding future fuel prices. Higher or lower fuel prices can change the relative attractiveness of all vehicle types, either making more fuel-efficient vehicles more attractive to consumers in a high oil price case or relatively less attractive in a low oil price case. For example, in the *AEO2012* High Oil Price case, the gasoline-only non-hybrid vehicle sales share declines to about 56 percent in 2035 compared to 65 percent in the Reference case, while in the Low Oil Price case, it rises to about 68 percent. Higher or lower fuel prices also affect projected vehicle efficiencies and growth in travel, which also affect the fuel mix and the level of fuel use. In the *AEO2012* High Oil Price case, overall LDV energy consumption decreases by 10 percent between 2010 and 2035, while LDV petroleum use in 2035 is 6.2 mmbd, 1.9 mmbd below its 2010 level.

Second, future costs will play a critical role in determining the future market penetration of advanced vehicle technologies. For example, plug-in hybrid and plug-in electric vehicle incremental cost is dependent primarily on the cost of its battery. In the AEO High Technology Battery Case, which assumes attainment of DOE's cost goals for high-energy batteries and non-battery traction drive systems in 2015 and 2030, sales of electric vehicles with a 100 mile range (EV100) are projected to reach 1.3 million in 2035, roughly four times their projected level in the Reference case. In addition, projected sales of plug-in hybrids reach 1 million units in 2035, more than four times their projected level in the Reference case, while sales of regular hybrids exceed 1.9 million, more than twice their projected sales in the Reference case.

Third, consumer acceptance is also a critical area of uncertainty regarding future market success of new vehicle technologies and alternative fuels. Vehicle attributes, such as cost and performance, as well as alternative fuel prices and availability, will play key roles in the future success of these alternatives. The availability of refueling infrastructure is a key factor affecting the future role of biofuels, natural gas, hydrogen, and electricity as vehicle fuels.

Finally, the future regulatory environment is also uncertain. CAFE and greenhouse gas emissions standards for LDVs are currently set in final rule through MY 2016 and have been proposed for MYs 2017 through 2025. The final standards for MY 2017 through MY2025, any standards that would be applied beyond MY 2025, or any changes to the RFS program are likely to have significant implications for projections of the LDV vehicle fleet and its fuel use.

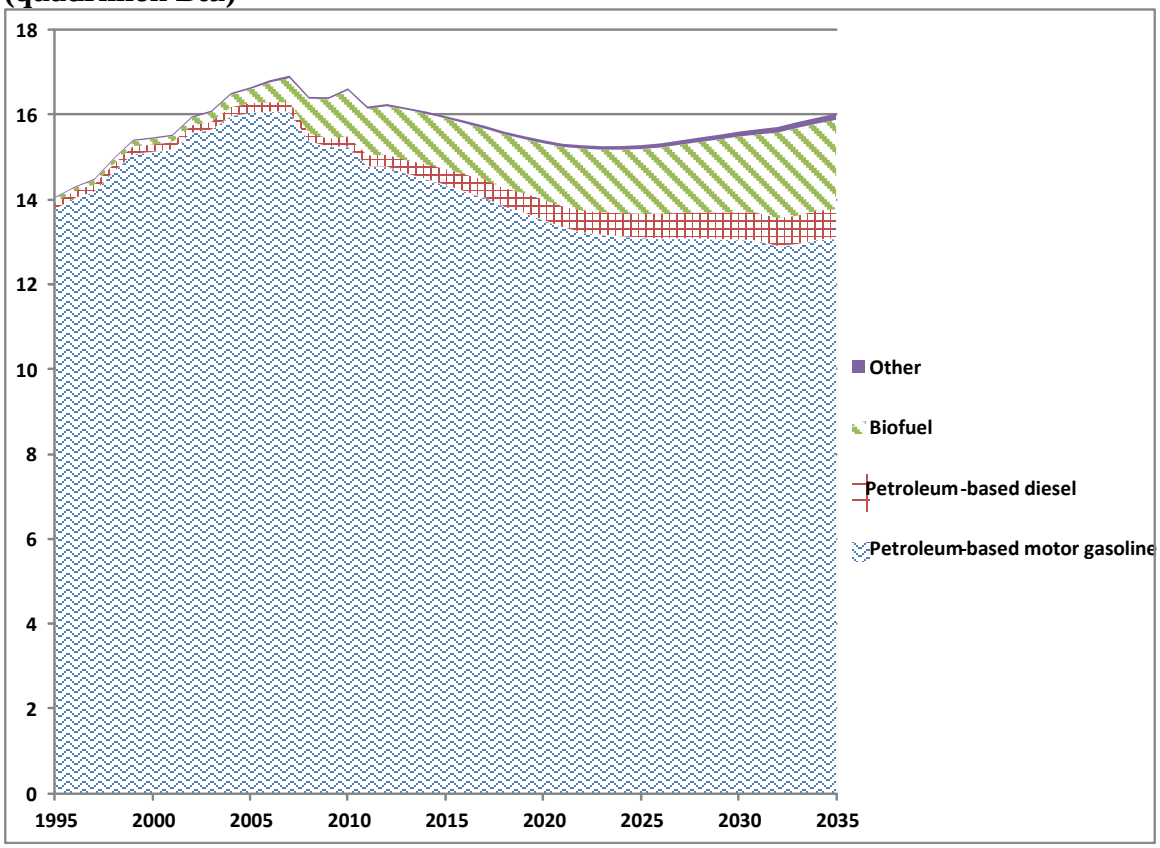
This concludes my statement, Mr. Chairman, and I will be happy to answer any questions you and the other Members may have.

Table 1: Growth in LDV Fuel Consumption and its Underlying Drivers, 2010-2035

	2010	2035	Growth (2010-2035)
Reference case			
Fuel consumption (quadrillion Btu)	16.6	16.1	-3%
Number of licensed drivers (millions)	210	269	28%
Miles per licensed driver	12,700	13,300	5%
Efficiency of vehicle stock (mpg)	20.4	28.2	38%
CAFE Standards case			
Fuel consumption (quadrillion Btu)	16.6	13.4	-20%
Number of licensed drivers (millions)	210	269	28%
Miles per licensed driver	12,700	13,600	7%
Efficiency of vehicle stock (mpg)	20.4	34.5	69%

Source: EIA *Annual Energy Outlook 2012*, Reference case run d020112c and CAFE Standards case run d032112a.

Figure 1. Light-duty vehicle energy use by fuel in the *AEO 2012* Reference case (quadrillion Btu)



Source: EIA *Annual Energy Outlook 2012*, Reference case run d020112c