STATEMENT OF

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BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES

UNITED STATES SENATE

July 23, 2008

Mr. Chairman, Ranking Member Domenici, Members of the Committee, thank you for the opportunity to appear before you today to discuss the status of existing Energy Department programs targeted at reducing gasoline demand and transportation greenhouse gases in the near term.

Reducing petroleum dependency can help improve national prosperity, energy security, and environmental stewardship. Petroleum provides close to 40 percent of our total energy use, and, to date makes up about 48 percent of our trade deficit.[1] Rising gas prices present a threat to our economic stability and the link between petroleum supply and our economy is direct and precarious. Likewise, our petroleum dependence contributes to climate change and threatens our energy security, as it puts our supply at risk to unpredictable global events.

The transportation sector accounts for about two-thirds of U.S. petroleum use.[2] Correspondingly, transportation is also a significant contributor to climate change, accounting for 31 percent of our carbon dioxide emissions.[3] To help curb our addiction to oil, President Bush announced the "Twenty in Ten" initiative in his 2007 State of the Union address. This initiative proposed to reduce projected gasoline usage by 20 percent in 10 years, to be achieved in two ways. First, the supply of renewable and alternative fuels would be increased to displace 15% of projected gasoline use. Second, the Corporate Average Fuel Economy (CAFE) Standards for cars and light trucks would be modernized to reduce projected gasoline use by an additional 5%.

Congress responded to the Twenty in Ten initiative by passing the Energy Independence and Security Act of 2007 (EISA) that sets a mandatory renewable fuel standard (RFS) requiring fuel producers to use at least 36 billion gallons of biofuel in 2022 and set a national fuel economy standard of 35 miles per gallon by 2020. These EISA provisions will achieve substantial reductions in oil use and greenhouse gas emissions. However, there will be challenges in achieving these dramatic reductions.

New technologies must meet criteria for cost competitiveness, performance and reliability. Products must meet those criteria with a high degree of confidence because consumers will expect products to be fully warranted. However, it is also critically important to accelerate the rate in which technology is introduced so that better and more efficient technology can replace current assets. Consider that it takes approximately 15 years for a new automotive technology to achieve full market penetration,[4] it has taken hybrid vehicle technology seven years to achieve a U.S. market penetration of over 2%,[5] and the average lifetime of a new vehicle is over 15 years.[6] Placing new fueling infrastructure is equally daunting. It has taken eight years to place just over 1,400 E85 fueling stations, less than one percent of the total number of U.S. fueling stations.[7] Therefore, the time it takes to fully realize the benefits of a new automotive technology is measured in decades.

The Department of Energy is working to shorten the time between research and commercialization so Americans will be able to drive more fuel efficient vehicles while at the same time reducing greenhouse gas (GHG) emissions and criteria pollutants. As part of this plan, DOE is pursuing

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[1] The 48 percent figure was calculated as a fraction of the goods trade deficit for the first four months of 2008, http://www.eia.doe.gov/oiaf/aeo/index.html.
[2] Transportation Energy Data Book, Edition 27, Table 1.13, http://cta.ornl.gov/data/tedb27/Edition27_Chapter01.pdf.
[3] "Emissions of Greenhouse Gases Report," EIA, November 28, 2007, http://www.eia.doe.gov/oiaf/1605/ggrpt/.
[4] *Light-Duty Automotive Technology and Fuel Economy Trends: 1975 Through 2006*, EPA420-R-011, July 2006, p. 62.
[5] Toyota Prius introduced in 2000, hybrid sales 2% of total 2007 sales. Electric Drive Transportation Association, Hybrid Sales Figures, http://www.electricdrive.org/index.php?tg=articles&topics=7.
[6] Transportation Energy Data Book, Edition 24, Tables 3.9 & 3.10, http://cta.ornl.gov/data/chapter3.shtml.
[7] "E85 Fueling Station Locations," DOE, http://www.eere.energy.gov/afdc/ethanol/ethanol_locations.html.

technologies that will significantly reduce petroleum use within five to ten years, as well as pursuing longer-term technologies. The Department continues to work with industry through its FreedomCar and Fuel partnership and 21st Century Truck Partnership. The Department and industry are on track to meet most of the FreedomCAR and Fuel 2010 technical targets.

Plug-In Hybrid Electric Vehicle Technology (PHEV)

Plug-in hybrid electric vehicles are one of the most promising technologies to decrease petroleum usage. DOE recently announced selections to accelerate the development, demonstration, and commercial introduction of Plug-In Hybrid Electric Vehicles (PHEV). Projects with Ford, General Motors, and General Electric/Chrysler, are targeted to demonstrate the technical and performance of PHEVs and result in the commercial introduction of at least three vehicle models.

DOE's Advanced Vehicle Testing Activity provides benchmark data for its research and development programs and also assists fleet managers, who are often early adopters of alternative energy vehicles, in making informed vehicle purchase, deployment and operating decisions. This testing documents the petroleum reduction potential, the infrastructure requirements, and operator use patterns. The testing to date has demonstrated very high fuel economy in mostly urban applications. The challenge to widespread PHEV production continues to be limitations in battery life, size, and cost, issues that DOE is also working to solve.

Battery Accomplishments

The battery research effort is supporting the development of durable and affordable advanced batteries covering the full range of vehicle applications. The higher fuel economy and reduced greenhouse gas emissions of today's hybrids (HEVs) are due in large part to the progress in battery technology resulting from the DOE's Energy Storage R&D activities.

Current DOE HEV and PHEV research is focused on lithium batteries that are projected to have two to four times the energy content, on a weight or volume basis, of nickel metal hydride batteries. The first commercial HEV to use a lithium battery is expected to be the 2009 Mercedes Benz S400 hybrid vehicle, which will use a lithium battery developed with DOE support.[8] Lithium batteries developed with DOE support are also expected to be used in the Chevy Volt PHEV that is scheduled to be introduced in 2010. The Volt is designed to achieve a driving range of 40 miles on electric power, meeting the range needs of most urban commuters.[9] With fuel economy expected to reach 120-150 mpg, PHEVs could displace million of gallons of fuel.

Combustion Engine Technology

Developing and introducing high-efficiency combustion engines in conventional, hybrid electric and plug-in hybrid electric vehicles offers the most promise to improving fuel economy in the near future. DOE is helping to develop increasingly efficient combustion engines that meet the needs of consumers and businesses.

Diesel engines are essential to trade and commerce. Over 90 percent of freight is moved by diesel-powered commercial vehicles (trucks). Unlike passenger vehicles, trucks cannot reduce their size

[8] "Mercedes-Benz S400 Hybrid Will Roll Out in 2009 With Breakthrough Li-Ion," *Popular Mechanics*, March 5, 2008, http://www.popularmechanics.com/blogs/automotive_news/4253307.html.
[9] Chevrolet – New Electric Car, http://www.chevrolet.com/electriccar/.

and continue to maintain their freight capacity. Cooperative work by the Department of Energy and heavy duty diesel engine manufacturers has resulted in improvements in engine efficiency that still meet stringent EPA emissions standards.

With the help of our research, a new fuel-efficient diesel engine meeting 2010 emissions standards was introduced by diesel manufacturer Cummins, Inc., and is being sold in Dodge Ram pickup trucks. In 2010, Cummins will introduce a new diesel engine co-developed with DOE for a Chrysler light-duty pickup truck/SUV. The diesel engines in both of these applications will provide an average of 30 percent fuel savings over gasoline-powered engines for comparable vehicles. For the future heavy-duty diesel vehicles, we are targeting an additional 20 percent improvement in fuel economy through further engine optimization and novel waste heat recovery strategies.

DOE Advanced Biofuels Research, Development, and Demonstration

The Department actively supports biofuels production, from the most basic science research activities to efforts toward the integration of advanced biofuels into the national fuel supply. To help meet our long-term energy needs, the Department's biomass research and development activities are designed to make biofuels from non-food feedstocks cost competitive by 2012.

The biomass feedstocks of today include grains, as well as oilseeds from plants. Our goal is to allow future feedstocks to come from a variety of sources such as wastes and residues, and fast-growing energy crops. These future feedstocks may consist of agricultural residues like stalks and stems, as well as forest resources such as wood waste, forest thinnings, and small-diameter trees. Examples of energy crops include switchgrass, miscanthus, and hybrid poplar trees, in addition to algae and non-edible oilseeds like jatropha. Sorted municipal solid waste may also play a role.

Cellulosic ethanol is expected to improve upon the positive energy balance of today's corn ethanol by delivering four to six times as much energy as needed for production.[10] Additionally, cellulosic feedstocks can reduce life-cycle greenhouse gas emissions by 86 percent compared to gasoline.[11]

Flexible Fuel Vehicles

Currently, there are more than six million flexible-fuel vehicles (FFVs) on our roads that can utilize ethanol blended gasoline up to 85 percent ethanol and 15 percent gasoline (E85). Although this is a significant number, it is only 2.7% of the 222 million cars in the light duty fleet.[12] We encourage all automobile manufacturers to meet and exceed stated voluntary targets for increasing sales of FFVs. We applaud the domestic auto manufacturers for their pledge to the President to make half of their vehicles E85 compatible by 2012.[13] We are hopeful that this encouraging trend will continue and stand ready to work with the automotive industry to that end.

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[10] Source: Wang et al, "Life-cycle energy and greenhouse gas emission impacts of different corn ethanol plant types," *Environmental Research Letters*, May 2007.

[11] Ibid.

[12] Estimated Number of Alternative Fueled Vehicles in Use in the United States by Fuel Type, 2003-2006, http://www.eia.doe.gov/cneaf/alternate/page/atftables/afvtrans_v1.xls. For total number of vehicles on the road: 2006 data from TEDB Edition 27, Table 2.12.

[13] Biofuels, GM, http://prod.gm.gmgssm.com/experience/fuel_economy/e85/index.jsp?deep=what&exist=false. Ethanol Vehicles – Flexible Fuel, Ford Motors. https://www.fleet.ford.com/Showroom/environmental_vehicles/ethnol_vehicles.asp. Ethanol / Flexible Fuel Vehicles. Chrysler. https://www.fleet.chrysler.com/fleetcda/portal?pageid=496d75dfeca67110VgnVCM100000e9261c35RCRD&sectionid=e726cce1be7f5110VgnVCM10000091f4e735RCRD&ptitle=E85%20-%20Flex%20Fuel.

In order to improve the efficiency of future FFVs, the Department is partnering with industry to develop the next generation of engines for these vehicles. These projects are targeting production-ready engines optimized for use of ethanol at all blend levels. These projects seek to develop systems which can reduce or eliminate the fuel economy penalties associated with the reduced energy content of biofuels.

Intermediate Ethanol Blends

The Department realizes that achieving large near-term gains through an FFV/E85 approach is difficult due to the pace of vehicle and infrastructure deployment. While we continue to strongly support the spread of FFVs and fueling infrastructure, there are important immediate steps which may provide relief sooner. The use of intermediate blends of ethanol – those between E10 and E85 – in conventional (non-flexible-fuel) vehicles is one such approach. If found to be compatible with existing infrastructure, vehicles and non-road gasoline engines, an intermediate-blends approach could accelerate the expansion of ethanol into the market. Intermediate ethanol-gasoline blends could also enable continued, uninterrupted growth in ethanol production and help to alleviate concerns about the looming "ethanol blend wall" where continued growth in ethanol production is constrained by E10 and the inability to rapidly accelerate deployment of E85.

The Department is engaged in a testing effort to determine the impacts of intermediate blends on existing vehicles and on non-road engines. The testing program is being conducted in cooperation with the Environmental Protection Agency (EPA), U.S. Department of Transportation and other partners, and has benefited from input provided by the automotive industry, the energy industry and the manufacturers of small engines.

Clean Cities

The Clean Cities deployment program supports local decisions to reduce petroleum use in transportation. To accomplish this goal, the program encourages the public and private sectors to reduce petroleum consumption by utilizing alternative fuels and increased vehicle efficiency. Specifically, it promotes the use of five major technologies: alternative fueled vehicles, hybrid electric vehicles, idle reduction technologies, fuel economy measures, and low-level fuel blends.

Clean Cities carries out its mission through 86 geographically-diverse coalitions nationwide.[14] Coalitions operate at the community level, designing projects to suit their area's needs, resources, and strengths. Clean Cities also provides a number of resources to the public, including a station locator and mapping system that allows consumers and fleet managers to find local alternative fuel stations. A trip planning tool allows drivers to plan their journey and maps refueling locations along the route. The website also provides a list of federal and state incentives for the purchase and use of alternative fueled and fuel efficient vehicles. Clean Cities, in partnership with EPA, also sponsors the publication of the annual Fuel Economy Guide.

[14] Clean Cities Coalition Locations: http://www.eere.energy.gov/cleancities/progs/coalition_locations.php.

Hydrogen Fuel Initiative

Hydrogen also continues to be an important part of DOE's balanced portfolio through the President's Hydrogen Fuel and Advanced Energy Initiatives, along with strong collaboration with Industry through the FreedomCAR and Fuel Partnership. We have made tremendous progress – doubled automotive fuel cell durability, decreased fuel cell cost by 65%, and decreased the cost of hydrogen to be competitive with gasoline – since before these initiatives.

Commercialization

Bringing these new technologies to market will take substantial capitalization. A principal purpose of the Energy Policy Act of 2005 (EPACT) Title XVII loan guarantee program is to encourage early commercial use of new or significantly improved energy technologies. This program is an excellent opportunity to help secure capital to address key challenges such as scaling battery manufacturing. In late June 2008, DOE announced solicitations totaling over $10 billion in Federal loan guarantees, including guarantees that are applicable to reducing petroleum dependency in the transportation sector.

Conclusion

Research and development of vehicles and fuels has led to new fuel saving technologies, some of which are in the marketplace today. Vehicle manufacturers continue significant research efforts to reduce fuel consumption or to replace petroleum, and investment in alternative fuels, such as biofuels remains strong. We believe that pursuit of the technology options described above has the most potential to reduce petroleum consumption in the near-term and long-term.

However, accelerated introduction of new vehicle technologies is inhibited not only by improvements still required in cost, performance and reliability of these technologies, but also by the time it takes to introduce these technologies and replace incumbent technologies. It may be beneficial to evaluate ways to bring new vehicle technologies and infrastructure to consumers faster. Any approach should minimize undue hardship or economic downturn to owners who have invested in today's installed assets.

Mr. Chairman, thank you again for holding this important hearing and for the opportunity to address how DOE is helping reduce gasoline consumption. This concludes my prepared statement, and I would be happy to answer any questions the Committee Members may have.