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INTRODUCTION

Chairman Boxer, Ranking Member Vitter, and Members of the Committee, thank you for the opportunity to discuss the Department of Energy's (DOE's) work on renewable fuels.

As part of the President's sustained, all-of-the-above approach to American energy, the Department is working to develop a diversity of advanced fuel and vehicle technologies that can secure our energy future and provide consumers with greater choice with the goal of saving energy, reducing costs and addressing climate change.

As Deputy Assistant Secretary in the Office of Energy Efficiency and Renewable Energy (EERE), I am responsible for overseeing DOE's portfolio of renewable energy research, development, demonstration, and deployment activities.

Biofuels have an important role to play in increasing our energy security, fostering rural economic development, and reducing greenhouse gas emissions from the transportation sector. The Department supports the goal of the Renewable Fuels Standard to increase biofuel production and use, and is investing in research, development, and demonstration (RD&D) to help bring next-generation biofuels on line. This is an important component of the Department's work to leverage partnerships between the private and public sectors to deploy cleaner fuels, including advanced batteries and fuel cell technologies, in every transportation mode.

The transportation sector accounts for approximately two-thirds of the United States' oil consumption and contributes to one-third of the Nation's greenhouse gas (GHG) emissions.[1] Net expenditures for imports of crude and petroleum products have been hundreds of billions of dollars every year. After housing, transportation is the second biggest annual expense for most American families.[2] Improving fuel efficiency of vehicles and developing alternative fuels represents one of the best opportunities we have to reduce our dependence on oil and lower our transportation costs. The economic, national security and environmental costs of our existing vehicles and transportation infrastructure make developing advanced, more fuel-efficient vehicles and alternative fuels an imperative for the Nation.

Today, I will address DOE's role and progress in the research, development and demonstration of advanced biofuel and associated vehicle technologies.

[1] http://www.eia.gov/totalenergy/data/annual/pecss_diagram.cfm and http://www.eia.gov/oiaf/aeo/tablebrowser/#release=AEO2012&subject=0-AEO2012&table=17-AEO2012&region=1-0&cases=ref2012-d020112c

[2] http://www.bls.gov/news.release/cesan.nr0.htm

VEHICLE PROGRESS AND EFFORTS

Biomass is a direct, near-term alternative energy resource for supplying liquid transportation fuels to the nation. Starch-based ethanol is a well-established commodity fuel with wide market acceptance through low- level blends in conventional vehicles and at higher blends in flex-fuel vehicles. The vast majority of the ethanol in the U.S. fuel market today is starch-based ethanol, as cellulosic ethanol technology is currently moving towards early commercialization. In the United States, nearly all gasoline is now blended with ethanol, up to 10% by volume (known as E10).

In November 2010 and January 2011, the Environmental Protection Agency (EPA) issued partial waivers that permit the use of gasoline containing up to 15% ethanol by volume (or E15) in model-year 2001 vehicles and newer. DOE worked closely with EPA to provide data needed to determine the potential impact of E15 on compliance with vehicle and engine emission standards established under the Clean Air Act. Using DOE and other test data, EPA ultimately determined that E15 may be introduced into commerce for use in model year 2001 and newer passenger vehicles. This means that EPA has approved the use of E15 for about 65 percent of the passenger vehicles on the road, vehicles that are estimated to account for more than 70% of the miles driven.[3]

DOE estimates approximately 6 percent (14 million out of approximately 237 million) of passenger vehicles on the road today are already manufactured to be compatible with blends up to 85 percent ethanol. Roughly 20 percent of new vehicle sales are also E85-compatible, though the infrastructure to dispense high-level ethanol blends such as E85 is not widely available.[4] DOE estimates that the incremental cost of manufacturing vehicles to be E85-compatible is in the range of $50-$100/vehicle.[5]

PROGRESS ON ADVANCED BIOFUELS

The Department of Energy's Bioenergy Technologies Office aims to develop and transform our renewable biomass resources into commercially viable, high performance biofuels and bioproducts through targeted RD&D supported through public-private partnerships.

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[3] Vehicle fleet age modeling by Argonne National Laboratory using the VISION model on December 4, 2012. Using VISION AEO 2013 Base Case, September, 2013. Available at: www.transportation.anl.gov/modeling_simulation/VISION/

[4] There were 2,637 stations dispensing E85 as of Nov. 25, 2013. See: http://www.afdc.energy.gov/fuels/stations_counts.html

[5] R.L. Polk & Co.

Cellulosic Ethanol

Cellulosic ethanol, like starch-based ethanol, can be used to displace gasoline for light duty vehicles. Through research and development (R&D) efforts, the cost of converting cellulosic biomass to fuel ethanol is becoming competitive. Over the past ten years, breakthroughs in biomass pretreatment and enzymes have helped reduce the modeled costs of cellulosic ethanol produced via biochemical conversion from over $13.40 per gallon gasoline equivalent in 2001 to a modeled mature technology, wholesale finished fuel cost of less than $3.26 per gallon gasoline equivalent.[6] After DOE successfully demonstrated technologies to produce cost-competitive cellulosic ethanol in FY 2012—the culmination of two decades of conversion technology R&D—the first pioneer scale demonstration facility produced its initial product in 2013.

Drop-In Fuels

DOE and the bioenergy community are now leveraging cellulosic ethanol RD&D successes to accelerate cellulosic and algal "drop-in" biofuels technologies that can be used to displace petroleum-based gasoline, diesel and jet fuel. Successful RD&D investments in cellulosic ethanol have provided foundational knowledge and capability at national laboratories, in industry and at universities to develop the more challenging bio-based gasoline, diesel, and jet fuels. "Drop-in" hydrocarbon biofuels are advantageous because they are largely compatible with existing infrastructure to deliver, blend, and dispense fuels. Also, "drop-in" fuels can be used in heavy duty vehicle applications, home heating oil, and other transportation modes to displace diesel and jet fuel in addition to gasoline. Through RD&D, DOE seeks to contribute significantly to making cellulosic "drop-in" biofuels competitive with petroleum-based fuels, achieving a modeled mature-technology wholesale finished-fuel cost of renewable gasoline, diesel and jet fuel of less than $3.00 per gallon by 2017,[7] and validate multiple technology pathways (i.e. a diversity of feedstocks and conversion options) by 2022.

EERE's conversion R&D is focused on developing technologies to convert feedstocks into commercially viable liquid transportation fuels, as well as bioproducts. Moreover, EERE's feedstock supply R&D is focused on developing technologies to provide a reliable, affordable, and sustainable biomass supply. This R&D is conducted in partnership with the U.S. Department of Agriculture (USDA) and DOE's Office of Science and the Advanced Research Projects Agency-Energy (ARPA-E). EERE's primary focus is on feedstock resource assessment, feedstock logistics (i.e., harvesting, storage and transportation) and algal feedstock supply R&D.

[6] See: http://www.nrel.gov/docs/fy14osti/60663.pdf

[7] At $3.00 per gallon, DOE estimates that these biofuels would be approximately cost-competitive with equivalent petroleum-based fuels produced at a crude oil price of $100 per barrel.

Integrated Biorefineries

DOE's biofuels demonstration and deployment activities focus on Integrated Biorefineries. As of September 2013, the Bioenergy Technologies Offices has 24 active biorefinery projects, 17 of which are either under construction or in operation. These competitively awarded projects are cost-shared by industry so that taxpayer investments are reduced. The objective of these first-of-a-kind technology projects at pilot, demonstration, and pioneer commercial scales is to validate key technical and economic performance parameters. The critical data from these various demonstrations then feeds back to inform our future R&D investments and provides information on the technologies' commercial readiness.

With the first pioneer scale demonstration facility producing initial product in 2013, it is expected that additional commercial scale facilities will come online in 2014. DOE has played a major role in development of technology and scale up in four commercial scale biorefineries either complete or under construction. Once these plants successfully pass through commissioning and start up phases, they are expected to produce up to 80 million gallons per year of advanced biofuels during steady-state operations. Pilot-scale, demonstration-scale, and pioneer, first-of-a-kind commercial-scale integrated biorefineries are critical components of the Federal government's efforts to advance the commercialization of biofuels from non-food sources by validating the technical, environmental and economic goals necessary for cost-competitive production.

Intra-DOE and Interagency Support

Within DOE, programs in EERE, the Office of Science, ARPA-E, and the Loan Guarantee Program have all made coordinated investments in next- generation biofuels technologies. DOE also works closely with EPA, USDA, the Department of Defense, the Department of Transportation's Federal Aviation Administration and other Departments and agencies to accelerate U.S. use of renewable fuels.

CONCLUSION

With efforts like DOE's bioenergy technology development program, the Department believes the United States can position itself as a leader in the global clean energy sector. Working with industry and state and local partners from across the country, DOE's renewable fuels and transportation technologies portfolio will benefit consumers, reduce greenhouse gas emissions, improve national security through reducing our dependence on oil, and keep America competitive and on the cutting edge of clean transportation energy technologies. Thank you again for the opportunity to discuss these issues, and I welcome any questions.